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PLACENTA CIRCUMVALLATA*

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IN THE course of the systematic examination of a large series of placentae during the past few years, my attention was drawn, as never before, to this abnormality, and, upon finding that I encountered it several times in the 150 or more placentae which pass through my hands each month, I began to study it with care. Each specimen was preserved in toto and photographed and, after hardening, blocks were excised from appropriate areas and submitted to microscopic study. When some thirty specimens had been studied, I thought that I would be able to make a substantial contribution to the anatomic structure and mode of production of the abnormality; but when I came to review the abundant literature, I found that such was not the case, but instead that each of my presumably new observations had previously been made by others. At the same time, I found that the literature abounded in contradictory statements upon every point, whether anatomic or clinical, and that many of the theories concerning its mode of production were so manifestly incorrect; I thought it might be profitable to review the subject briefly and to record my own observations.

Figs. 1 to 3 are photographic reproductions of three of my specimens and clearly illustrate the salient gross features of the abnormality, the most striking of which consists in the presence of a more or less complete circular ring upon the fetal surface of the placenta at varying distances from its margin. The ring varies from 0.5 to 1.5 cm. in width, is slightly elevated above the general surface, and usually presents a whitish or yellowish opaque appearance. If the ring is complete, it divides the fetal surface into two distinct areas, a central portion bounded by the inner margin of the ring and a lateral

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zone peripheral to it. Usually the ring lies somewhat eccentrically, so that the width of the peripheral portion may vary greatly in different locations.

The central area presents the appearance which is common to the fetal surface of the normal placenta. To it the cord is attached, and over it course the large fetal vessels. The latter are uniformly absent from the peripheral portion, and their terminal branches turn directly downward into the substance of the organ before reaching the ring.

The inner margin of the ring is sometimes rounded, but more commonly it is quite sharp and appears as a flattened fold, over which

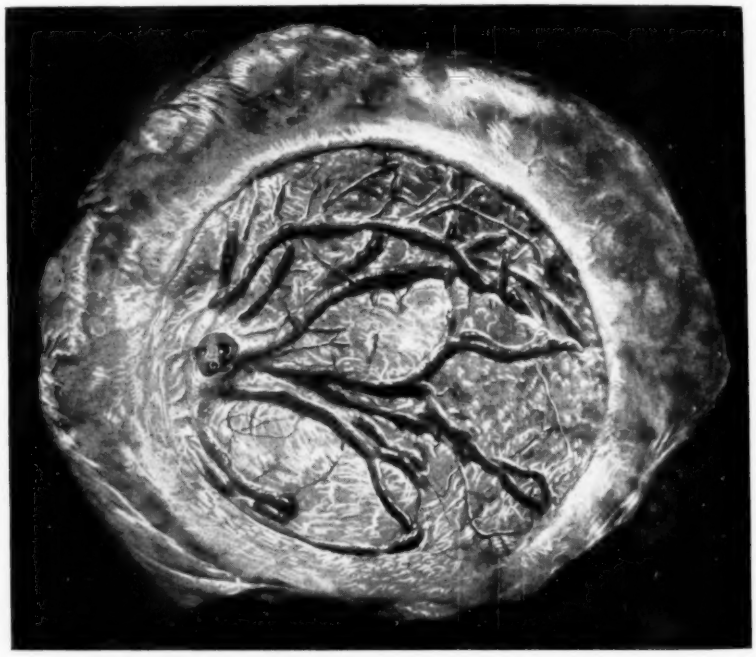

Fig. 1.—Complete placenta circumvallata. x ⅗

the amnion extends on its way from the central to the peripheral portion of the placenta. On casual examination, as shown in Figs. 1 and 3, the fetal membranes appear to extend over the ring to the periphery of the placenta, but closer investigation shows that they do not constitute an integral part of the peripheral zone but, instead, are very loosely attached to the fetal surface of the placenta, and, upon being detached leave exposed a reddish, slightly roughened underlying tissue, which as will be pointed out later, consists of decidua (Fig. 2).

In other words, the fetal membranes, instead of being deflected, as normally, from the free margin of the placenta, arise from the outer margin of the ring and are only loosely applied to the portion beyond it.

Furthermore, the chorionic membrane, instead of making up the entire fetal surface of the placenta, has become reduced in area, and peripheral to the ring is surrounded by an extrachorionic portion which is covered by decidua. In the detached normal placenta only the maternal surface is covered by decidua, but in this abnormality a considerable portion of the fetal surface is likewise so covered.

Before attempting to explain why this is the case, or entering into any discussion of the mode of production of this abnormality, I shall give a brief review of its history and of the various attempts which have been made to explain its genesis, and incidentally I shall discuss the terminology employed in connection with it. Although placenta circumvallata must have occurred from time immemorial, many Ger-

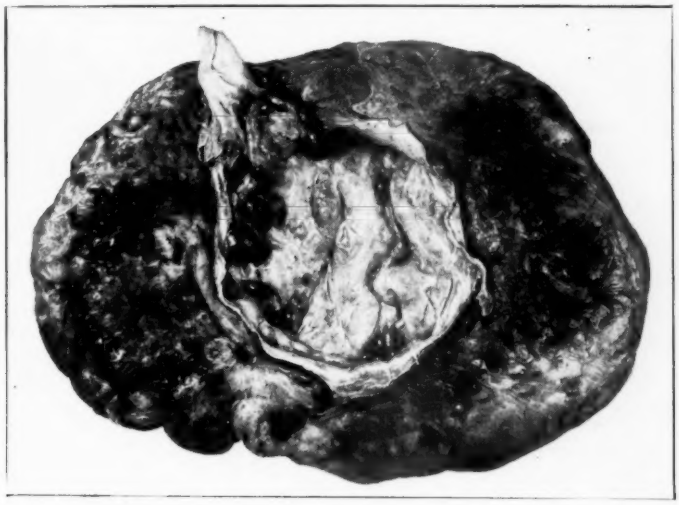

Fig. 2.—Placenta circumvallata with unusually small chorionic membrane and unusually wide extrachorionic portion of fetal surface. x 3/7

man writers state that it was first described by William Hunter, but I have been unable to locate his description. The condition was incidentally mentioned by Busch in 1836, who introduced the term "annulus fibrosus" in connection with it, but to Köllicker must be ascribed the credit of having directed especial attention to it; as, in the second edition of his textbook on *Embryology* (1879), he accurately described the abnormality, stated that it was of relatively frequent occurrence, and thereby stimulated subsequent investigation. It might also be mentioned that Roncaglia states that Fabbri had antedated Köllicker by several years. While this is doubtless correct, it does not alter the fact that it was the impetus given by Köllicker which aroused the interest of German investigators in the subject.

It would appear that considerable confusion in terminology exists, and that many writers employ the terms placenta circumvallata and

marginata indiscriminately, while such designations as placenta marginé, brodé and collarette are employed by the French. This is so true, that Riehl in 1924 stated that one may have to deal with several varieties of placenta "marginé" instead of with a single one, and in my reading I have often found it impossible to obtain a clear idea of what the various authors had in mind. This is probably due to the fact that under the designation marginata various conditions, beside placenta circumvallata, have been included—one of the most common being the ordinary marginal infarct, in which a narrow band of white infarcted tissue completely or partially encircles the margin of the placenta or may lie several centimeters inside of it. This, however,

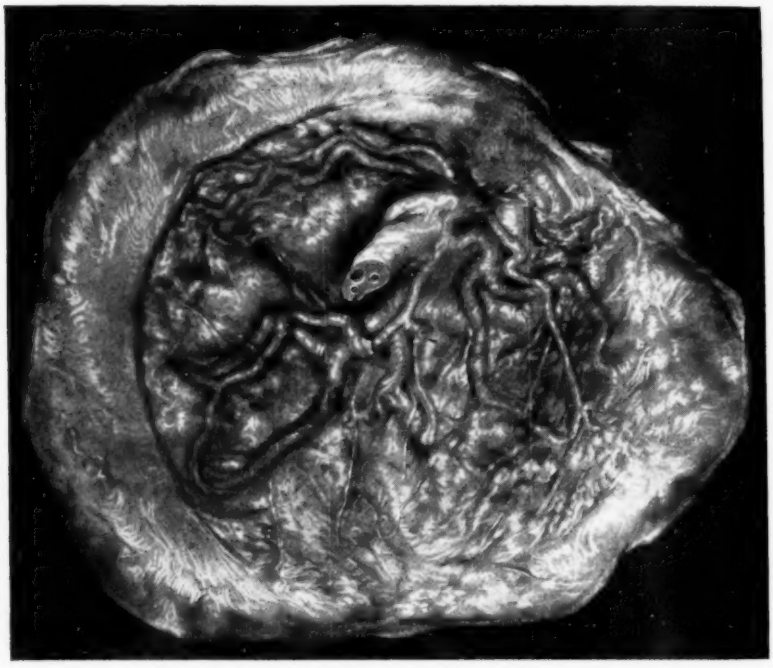

Fig. 3.—Partial placental circumvallata. x ⅔

has nothing in common with the condition under discussion, as it is due to the deposition of a layer of "fibrinoid" upon the maternal surface of the chorionic membrane, and not to a fundamental disturbance in the structure of the placenta and in the relation of its membranes.

For these reasons, I think it advisable to discard entirely the term marginata and similar designations, to restrict the term circumvallate solely to the condition under consideration and to describe as marginal infarcts at least some of the conditions to which reference has been made. That some change is imperative is shown by the great

discrepancy in the statements of various authors concerning the frequency of placenta marginata. Herff, Bertkau, Funck, Del Vivo, and Corinaldes report an incidence of 7.6, 14, 20.9 and 21.3 per cent respectively, whereas I have encountered circumvallate placentae in less than two per cent of my material. Consequently, it is apparent that the figures just mentioned could have been obtained only by including various other conditions under the designation marginata. That such a supposition is correct is rendered probable by the statement of Bertkau that, while placenta marginata was noted in 14 per cent of his material, the incidence of the true circumvallate variety did not exceed 1.3 per cent,—a figure which tallies closely with my own.

Passing on to a review of the various explanations which have been advanced concerning the mode of production of the circumvallate placenta, it should be remembered that a correct explanation could scarcely have been expected until our views concerning the mechanisms involved in the implantation of the normal human ovum and in the early stages of placentation had become clarified. In this connection it should be recalled that Peters' ovum was not described until 1899, and that some years elapsed before its implications were generally accepted by embryologists, and a still longer period before the rank and file of obstetricians were able to free themselves from old and erroneous teachings. Furthermore, it must be borne in mind that any theory concerning the origin of the circumvallate placenta must afford a reasonable explanation for the following facts:

1. The restriction of the chorionic membrane to the central portion of the fetal surface of the placenta.

2. The extension of the membranes from the outer margin of the ring instead of from the periphery of the placenta.

3. The presence of a decidual covering over the peripheral extrachorionic portion of the fetal surface of the placenta.

4. The folded appearance of the inner margin of the ring, and

5. The structure and mode of formation of the "annulus fibrosus."

Approximately speaking, the theories advanced in explanation of the genesis of the abnormality may be grouped in one of the following categories:

1. Endometritis and inflammation of the decidua.

2. Proliferation and induration of the decidua marginalis (Rand-reflexa).

3. Deep implantation of the ovum upon a restricted area of the decidua basalis.

4. Mechanical interference with implantation associated with the presence of double ovum twins.

5. Abnormal mobility of the fetal membranes ("Stauchung").

6. Primary insertion of the ovum in a uterine cornu ("Tubenecke Placenta").

7. Lack of coordination between the several factors which regulate the growth of the placenta and of the uterine wall, as well as variations in the intrauterine and intraplacental fluid pressures.

8. Early rupture of the decidua capsularis and subsequent partial strangulation of the placenta.

9. Splitting of the decidua vera.

10. A primary restriction in the development of the chorion frondosum.

I shall consider each of these categories as briefly as possible, referring those interested in details to the publications of the several writers.

1. As early as 1885 Veit contended that inflammation of the endometrium or of the decidua afforded a satisfactory explanation for the production of the abnormality. He advanced no proof in support of his contention, but simply stated that he believed in its efficiency. For a time he found numerous adherents, but, after Krömer and Sfameni had expressed their skepticism, the theory gradually fell into desuetude. I need only state the inflammatory changes were present in only one of our specimens, and in that instance it could have played no causal rôle, as it had originated during the course of labor as the result of an incidental intrapartum infection.

2. In 1890, while still under the domination of old and erroneous views concerning implantation and placentation, Klein stated that if, as the result of inflammation, the "Rand-decidua," that is, the portion of the capsularis immediately adjoining the basalis, became thickened and indurated, it could prevent any further expansion of the chorionic membrane, so that if further growth of the villi were essential to the development of the ovum it could only occur beneath the indurated ring, so that eventually the extra chorionic portion of the fetal surface of the placenta would inevitably be covered by decidua. Klein's theory was accepted by Schwab, and partially by Krömer, although the latter was dubious concerning the part played by inflammation. At present, this view has only an historical interest, as we now know that the decidua does not grow up over and enclose the ovum as was believed at that time.

3. In the early eighties of the last century, Schatz, Küstner and others were inclined to attribute the condition to the fact that the ovum had become inserted upon an abnormally small area of the decidua basalis, so that if the pregnancy was to continue it would necessitate deep invasion of the decidua by the chorionic villi, with the result that the ovum would project in a polypoid-like manner, with a restricted chorionic membrane. This view can no longer be held for two reasons: first, that it is based upon erroneous conceptions concerning the process of implantation, and, second, because all early ova of the first month, which have been studied in situ, have been found to be implanted in the most superficial portion of the decidua.

4. Schatz, Krukenberg, Herff, Funck and others directed attention to the fact that the abnormality is not unusual in double ovum twins, because owing to lack of room the membranes of one twin displace in part those of the other. In this event, a part of the membranes of fetus I might come to cover part of the fetal surface of the placenta of fetus II, and thus simulate to some extent the conditions noted in placenta circumvallata. Apart from the fact that this theory can apply only to twin pregnancy, it must be abandoned; as, even in such circumstances, it could explain only the dislocation of the membranes and not the other more striking anatomic peculiarities of the placenta in question.

5. In 1906, Liepmann studied four pregnant uteri in which more or less crescentic folds of membranes projected into the interior of the uterine cavity and overlapped one margin of the placenta to a greater or lesser extent. He considered that it was only necessary for such a fold to become flattened out in order to give rise to the

circumvallate or marginate type. Furthermore, he held that the production of the folds was incidental to variations in the fluid pressure exerted by the amniotic fluid, as well as to variations in the intensity of the Braxton Hicks contractions, and were of the same character as motions imparted by pressure with the balls of the fingers to a piece of cloth stretched over a board and which he designated as "Stauchung." Bumm partially endorsed this mechanism, and he and Liepmann considered that it would be especially effective when the placenta was abnormally inserted in the lower segment or in a cornu of the uterus. To my mind, the theory is defective in that it is applicable only to partially circumvallate placentae, but more especially because it overemphasizes the importance of the membranous fold, and neglects such more important features as the restricted chorionic area and the presence of decidua upon the extrachorionic fetal surface of the placenta.

6. Although the part played in the production of this abnormality by the insertion of the ovum in a uterine cornu had been mentioned by others, it owes its greatest development to the monograph of Bayer which appeared in 1911. He stated that implantation frequently occurred in that locality and that its possibilities for harm were generally overlooked. He pointed out that the behavior of the junction of the tubal opening with the uterine cavity was comparable to that of the lower uterine segment, in that as pregnancy advances more and more of the tube becomes incorporated into the uterine cavity, with the result that the chorionic membrane becomes torn off from its villi in that region, and could then readily form a fold which might apply itself to the fetal surface of the placenta and become flattened out over it as pregnancy advanced. He was aware that his explanation was not universally applicable, and theoretically could hold good only for partial varieties of the abnormality, but at the same time, he believed that it was probably applicable in quite as many instances as the small basic theory of Schatz and Küstner. Here again, it would seem that, in common with the proponents of several other theories, he laid more stress upon the production of the ring than upon the other and more fundamental anomalies of the abnormality in question. In any event, this "Tubenecke" theory has played a considerable part in the doctrine of placenta marginata, and is mentioned whenever it is considered.

7. Sfameni in a seventy-page monograph, which appeared in 1908, stated that none of the theories advanced up to that time were of universal application, nor did they suffice to account for certain anatomic or clinical peculiarities in the individual specimens. He stated that in every pregnancy the form of the placenta is governed by the association and interaction of all or several of the following three factors: 1. the growth of the uterine musele; 2. the intraovular pressure; and 3. the interlacunal pressure—or the pressure exerted by the blood in the intervillous spaces, as well as by the growing villi. He then pointed out that the placenta in its earlier stages is cup-shaped, and assumes its discoidal form only as pregnancy advances. He held that the force exerted by the growing uterine muscle tends to bring about enlargement of the area of placental attachment; that that exerted by the intraovular pressure tends to flatten the organ, while the interlacunal pressure tends to make it thicker. Consequently, if all three forces act in unison the placenta will presumably be normal in form, whereas if the intraovular pressure is too feeble, or the muscular activity too strong, abnormalities are likely to result. It would lead too far to attempt to follow his reasoning in detail, but it will suffice to say that it appeared satisfactory to the author, but not entirely so to me. It is interesting to note that Hinselmann, in his almost incomprehensible and lengthy article in volume VI of *Biologie und Pathologie des Weibes*, inclines to a somewhat similar view, but admits that the problem is far from solution. Del Vivo and Corinaldes, likewise favor this view.

8. Lahm in 1924 advanced a new theory, in which he assumed that the egg had originally been deeply implanted in the decidua, and that as it increased in size the capsularis ruptured, probably through the scar marking the original point of ingress of the ovum, and through that opening the membranes and their contents (chorion, amnion and embryo) slowly escaped into the uterine cavity so that eventually all that remained at the original area of implantation was the chorion frondosum, which became sharply constricted by the decidual collar. He holds that the latter will eventually thin out and supply a decidual covering for the extrachorionic fetal portion of the placenta; while as the ovum expands the portion of membranes just beyond the collar would be folded back and give rise to the ring. The theory, while ingenious, does not appeal to me, for the reason that, in many of my full term specimens, traces of the decidua capsularis can be detected exactly where they should be lacking if Lahm's hypothesis were correct, that is outside of the chorion læve, and separating it from the extrachorionic portion of the placenta.

9. Von Herff in his papers of 1896 and 1907 came very near solving the problem, just as in the case of placenta previa, by ascertaining that the fetal surface of the placenta had obtained its decidual covering by a process of cleavage of the decidua as the result of the growth and extension of the more peripheral chorionic villi. This was the more remarkable, as at the time his first paper was written we possessed no accurate knowledge of the implantation of the ovum nor of the formation of the various decidual layers.

10. This brings us to the consideration of the last and most important theory, which in a way constitutes a continuation of the small basic theory of Schatz and of the views of von Herff. That the abnormality is the result of an originally too scanty development of the chorion frondosum was first clearly expressed by Robert Meyer in 1909, and was advocated half-heartedly by Funck, Bertkau, Seitz, Grosser and others, and, as will be seen later, is the view which I advocate personally.

Early in the second week, the entire exterior of the ovum is covered by short relatively thick villi, which for a short time increase in size and complexity at approximately the same rate. Later, those in contact with the decidua capsularis cease to grow and soon undergo atrophic change—chorion læve; while those in contact with the decidua basalis proliferate rapidly and give rise to the future fetal portion of the placenta—chorion frondosum. If for any reason, such as decidual abnormalities or defective energy on the part of the ovum, the chorion læve becomes relatively too large and the chorion frondosum too small, the pregnancy will not necessarily come to an untimely end, but may continue to grow. In this event, the membranous area of the chorion frondosum can only very gradually increase, while, if the ovum is to survive, rapid proliferation of its villi is essential. This can be accomplished only by their growing longer and extending outwards in a more oblique direction. If this occurs, they will invade and undermine the decidua at their periphery, which will result in a virtual splitting of that membrane into two lamellae, one of which will contribute to the expansion of the basalis, while the other will persist as a covering layer for the extrachorionic portion of the placenta. In this way one can explain the eventual development of a placenta of the usual size, but with a small chorionic membrane, from whose margins the chorion læve extends. As pregnancy advances, and more space is required for the growing ovum, the fetal membranes become bent backwards beyond the periphery of the chorionic plate, and thus come in contact with, but do not adhere to, the extrachorionic portion of the fetal surface of the placenta, while their folded inner margin forms the ring under discussion, which later may undergo degenerative or infarctive changes.

Beginning with Herff the majority of writers have asserted that the condition may give rise to serious clinical complications, such as

abortion, inexplicable uterine hemorrhage, premature labor, premature separation of the normally implanted placenta, and more particularly disturbances in the third stage of labor, such as imperfect separation of the placenta, retention of the membranes and postpartum hemorrhage with increased necessity for the employment of Credé's maneuver and manual removal. Others note the frequent association of the abnormality with the presence of placenta previa and cornual insertion. Such statements have been made by Herff, Sfameni, Funck, Bayer, Seitz and others, and Herff states that abnormalities of the third stage were noted in 39 per cent of his cases. Furthermore, certain writers claim that the condition is associated with a decrease in the weight of the children and with a diminution in the dimensions of the placenta, while others have directed attention to some increase in its thickness.

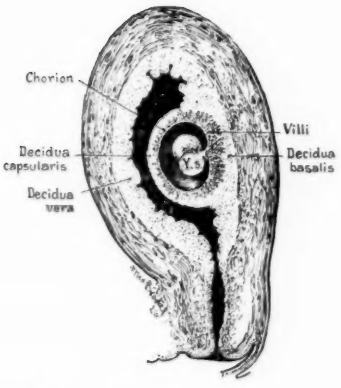

Fig. 4.—Diagram showing normal early pregnancy *in situ*—Chorion læve and beginning frondosum.

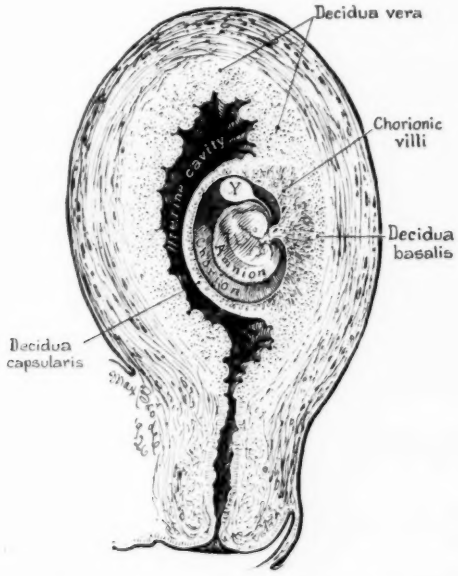

Fig. 5.—Diagram showing more advanced pregnancy—Chorion læve atropic, Chorion frondosum proliferating with its most laterally located villi invading the adjacent decidua.

I shall not enter into the details of this discussion, as such statements do not coincide with my experience; for, upon going over the clinical histories of patients presenting the abnormality, my impression is that it is practically without clinical significance and is to be regarded merely as an interesting anatomic condition. In none of our cases was it associated with abnormalities of the third stage of labor nor with premature separation of the placenta. Indeed, in my relatively large experience with the latter condition, in which the anatomic relations of the placentae were studied, I do not recall a single

instance of such an association, although I see no theoretic reason why it should not be occasionally noted. Likewise, I have not noticed any significant effect upon the size of the child nor upon that of the placenta, although it must be confessed that some are relatively thicker than usual.

On the other hand, I should hesitate to deny its occasional association with the production of abortion, although I have not as yet noted it. Various authors have directed attention to the similarity existing in the placental relations in so-called extramembranous pregnancy and the abnormality in question. I can neither affirm or deny it, as my

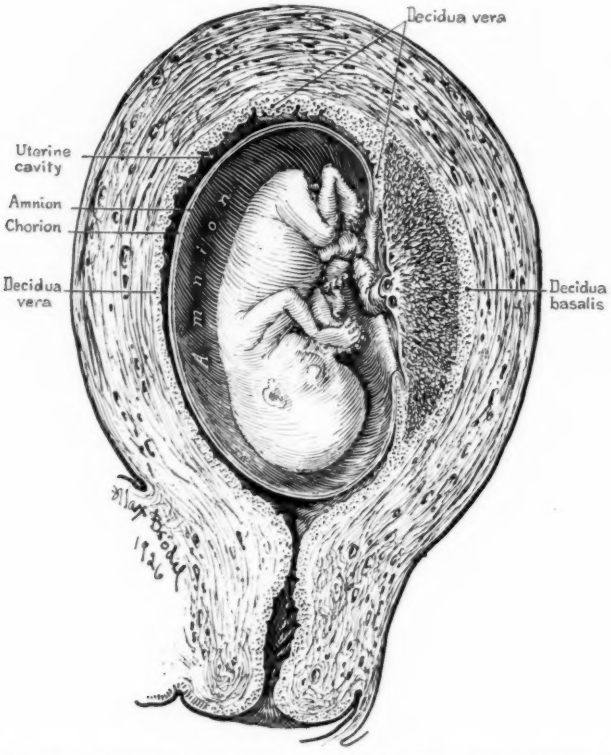

Fig. 6.—Diagram showing still more advanced pregnancy. Maternal surface of placenta in contact with decidua basalis. Fetal surface composed of central chorionic membrane and a peripheral extrachorionic zone covered by decidua. Fetal membranes reflected at margin of central portion giving rise to the circumvallate ring.

experience with the condition has been so scanty, that my opinion would be of no value.

Reverting to our own observations, it need only be said that consideration of the gross features of placenta circumvallata shows that we have to deal with a striking anatomic condition. Attention has been directed to the topography of the ring, to the restricted chorionic area, to the ease with which the membranes can be detached from the extrachorionic portion of the fetal aspect of the placenta, to the fact

that the latter is covered by a layer of decidua, and finally that the large fetal vessels do not extend over or into it, so that all that remains for consideration are my studies concerning the structure of the circumvallate ring, and its mode of production.

As has already been indicated the ring may vary greatly in gross appearance. In some specimens a true "annulus fibrosus" is present and presents a thick rounded inner border, so that it actually forms

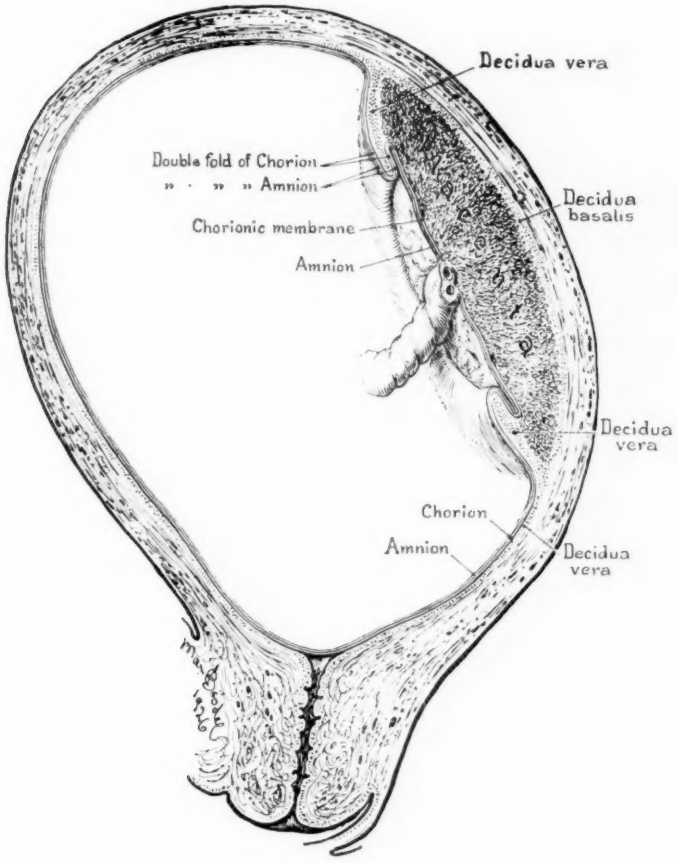

Fig. 7.—Diagram of uterus late in pregnancy, showing circumvallate placenta *in situ* with well developed "annulus." Note relations of chorionic membrane, extrachorionic decidua, and duplicature of membranes.

a wall about the central chorionic area, which may lie several millimeters below the surface of the ring. In other specimens the ring is thinner, and in that event its inner margin appears to be undermined, and on cross section appears as a tongue-shaped process projecting over the chorionic area and separated from it by a slit-like space, as is shown in Fig. 7. The amnion covering the chorionic area is reflected over the ring, and at its outer margin becomes continuous with the

membranes lining the uterine cavity. In other specimens, the ring is still thinner and appears as a mere fold of membrane scarcely exceeding a millimeter in thickness.

In general, it may be said that such variations are dependent upon the extent to which infaretion has occurred in the ring and in the adjoining tissues. When such changes are pronounced, the ring has a homogeneous whitish or yellowish color, but when they are absent it presents the bluish, white, translucent appearance characteristic of the normal fetal membranes.

The microscopic picture, likewise, varies with the degree of infaretion. When slight or lacking, sections show that the ring is composed of folded fetal membranes, and the picture will vary according as the portion studied is obtained from its inner margin, or from a more peripheral portion. In the former location (Figs. 6 and 7), one sees from within outward, a layer of amnion, a layer of chorion læve with its degenerated and atrophic villi, and beneath it a very thin layer of decidual tissue corresponding to the capsularis. Beneath the latter come the same three layers in reverse order; decidua capsularis, chorion læve, and amnion. Then follows a small space, and beneath it a third layer of amnion resting upon the chorionic membrane. It should be remembered that conditions must be especially favorable in order for one to make out the two thin layers of decidua capsularis, as in most specimens they have fused into a single layer.

In any event, the microscopic findings are usually sufficiently comprehensive to enable one to conclude that the ring has resulted from a folding or duplication of the fetal membranes at the margin of the chorionic membrane. Peripheral to the ring the picture is radically different, as we then have to deal with only a single layer of membranes, consisting of amnion, chorion læve and decidua capsularis, beneath which may be a narrow space, bounded on its other side by the layer of decidua covering the extrachorionic portion of the fetal aspect of the placenta, with which the chorionic villi are in immediate contact without the interposition of a chorionic membrane. Again, it should be remembered that especially favorable conditions must obtain if such a picture is secured, as the decidua capsularis and the placental decidua tend to coalesce and to appear as a single layer.

On the other hand, if infarctive changes have developed (and this is the rule on account of defective vascularization), an "annulus fibrosus" is produced and the fundamental relations become greatly obscured, with the result that in many specimens the amniotic epithelium is the only definitely characteristic tissue distinguishable, while the rest of the ring is made up of fibrinoid and of remnants of villi which have undergone fibrinoid or hyaline degeneration. But even in such specimens it is usually possible to discover a clue to the process, for on approaching the periphery of the placenta, the normal fetal membranes,

plus decidua capsularis, will be found in contact with, but not united to, the decidua covering the peripheral portion of the fetal surface of the placenta.

In the extruded placenta, the latter decidual layer can be followed to the margin of the organ, where it becomes continuous with the decidua basalis covering its maternal aspect. I consider it unprofitable to employ a special designation for the former, as it is a matter of indifference whether it is designated as vera or basalis; although strictly speaking, any part of the decidua to which functioning villi are attached could appropriately be designated by the latter term. For these reasons, I see no advantage in employing the term serotina marginalis as suggested by Funck, more particularly as the word serotina is becoming obsolete.

From what has already been said, it is clear that I agree with Meyer that the process is not necessarily associated with infarction, so that the presence of an "annulus fibrosus" should be regarded as a secondary phenomenon, and I hold that the essence of the abnormality lies in the restricted area of the chorionic plate, the folding of the membranes and the presence of a layer of decidua upon the extrachorionic portion of the fetal surface of the placenta.

How is this brought about? As the abnormality is associated with fundamental variations in the structure of the organ, it is apparent that it must originate in the early stages of placentation, that is, during the very first weeks of pregnancy. Unfortunately, however, I have not encountered it in any of the specimens of early pregnancy which I have studied. Consequently, whatever I may say must be regarded as inferential, instead of being based upon actual observations. Earlier in the paper, under heading 10, I stated that I believed that the abnormality resulted from a primary limitation in the extent of the chorion frondosum, with the result that if further development of the pregnancy was to occur it would be necessary for the villi at the periphery of the developing placenta to proliferate obliquely outward, and, in so doing, to undermine the adjacent decidua. Figs. 4, 5, and 6 afford a diagrammatic illustration of what I believe occurs. Fig. 4 represents a normal early pregnancy in which the chorion frondosum is just beginning to be differentiated from the chorion læve. Furthermore, Fig. 5 represents a pregnancy in a slightly more advanced stage of development. In it the chorion læve has already undergone atrophic changes, while the frondosum has proliferated to form the fetal portion of the placenta. In the drawing it has been attempted to indicate that, as the result of its restriction in area, the peripheral villi of the frondosum are extending more obliquely outward than usual and are invading and splitting the adjacent decidua.

Fig. 6 illustrates a somewhat more advanced stage of pregnancy, and shows, as the result of the peripheral proliferation of the chorionic villi, that the decidua has been split in such a way that while the decidua basalis is present as usual, abnormal conditions prevail at the margin of the placenta, as well as upon its fetal surface. Here it is seen that the decidua capsularis does not extend from the margin of the organ as usual to form the outermost layer of the fetal mem-

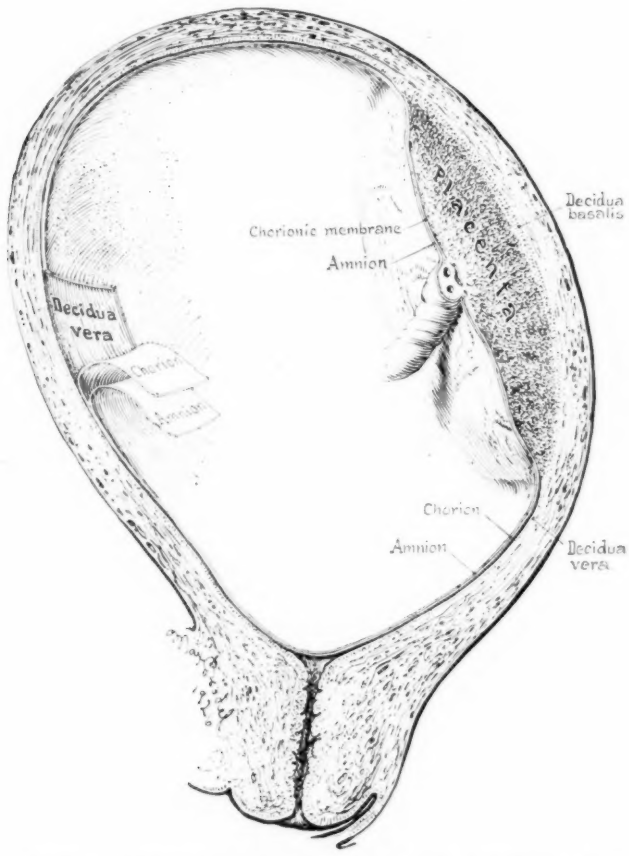

Fig. 8.—Diagram of uterus late in pregnancy, showing normal placenta *in situ*. Compare with Fig. 7, and note that chorionic membrane covers entire fetal surface, and that the membranes pass from the margin of the placenta to the uterine walls.

branes, but, that a layer of decidua covers a considerable part of the peripheral portion of the fetal surface of the placenta, while the chorionic membrane has become restricted in area, instead of covering the entire fetal surface.

It is apparent, so long as the embryo remains small, that the membranes will extend from the periphery of the restricted chorionic membrane, but as soon as greater space is required for the product of conception, and the extrachorionic portion of the placenta has in-

creased in size, the membranes must become folded upwards and outwards over the periphery of the chorionic membrane and that their outer covering of decidua capsularis will come to lie upon the layer of decidua covering the extrachorionic portion of the placenta.

Such a mechanism offers a satisfactory explanation for the folded margin of the ring, as well as for the other salient features of abnormality, and Fig. 7 gives a diagrammatic representation of the condition of affairs later in pregnancy; while Fig. 8 affords a means of comparing them with those obtaining under normal conditions.

Except for the infarctive changes noted in many specimens, I have been unable to detect any essential variations in the histologic structure of placenta circumvallata. That being the case, I have not been able to confirm the statement of Funck that the villi are generally larger and less abundant than in the normal organ.

Reference has already been made to the belief of many writers that placenta circumvallata predisposes to the production of various clinical abnormalities, and a few words will suffice to make my position clear. It is stated that it tends to be smaller in circumference and greater in thickness than the normal placenta, but, as my observations do not bear out such a contention, I believe that the variations occurring are well within the normal limits. Likewise, nothing that I have seen indicates that the abnormality exerts any effect upon the development or weight of the child. Naturally, extensive statistical study would be necessary to establish such a relationship, and the figures thus far available are far too few to permit any justifiable conclusion. Of one thing, however, I am sure, and that is that the condition does not predispose toward abnormalities of the third stage of labor, which in my experience has been as normal as under other circumstances. For this reason, I am at a loss to understand Herff's statement that 39 per cent of all patients in which expression of the placenta was required presented marginate or circumvallate placentae.

Finally, I may say that although in our experience placenta circumvallata possesses no clinical significance, it must nevertheless be regarded as a striking anatomic abnormality, which is of interest because it is associated with fundamental variations in the development of the organ, and that a satisfactory explanation for its genesis could scarcely be expected until our notions concerning the mechanisms involved in normal placentation had become established upon a firm foundation.

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JOHNS HOPKINS HOSPITAL.

TWO RARE OVARIAN TUMORS

ADENOFIBROMA, AND DERMOID CYST ASSOCIATED WITH MULTIPLE OVARIAN FIBROMATA

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I

ADENOFIBROMATA are complex tumors of benign type, in which epithelial and stromal elements simultaneously multiply. In the ovary their origin may be considered under the following groups:

1. From residual embryonal elements. In the adult ovary rete tubules are not infrequently encountered in the hilum, particularly near the cephalic end of the gland. In embryonal life sprouts from the rete cords unite with the medullary cords of the ovary and the mesonephric tubules. Lumina appear early and are lined with irregular epithelium. From this stage they regress and as a rule disappear. According to Bailey and Miller, the former view, that these tubules were of mesonephric origin, has been discarded. Newer investigation has conclusively demonstrated that they are derived from the germinal epithelium and unite with the wolffian gland tubules secondarily. Adler, in a demonstration of cases, reports an adenofibroma in the medullary portion of the ovary, which he ascribes to these tubules and their surrounding stroma.

2. From the aberrant wolffian duct tubules. The various types of endometrial glandular elements found in the ovary were previously ascribed to heterotopia of these tubules. The condition was first described by Pick and designated as adenoma endometrioides ovarii.

Since their rediscovery by Sampson and the exhaustive work that has followed, this opinion has lost ground. Sampson ascribes the aberrant tubules in the cortex of the ovary as implants from the uterine endometrium. The German school (Robert Meyer) believes the origin to be from the surface germinal epithelium. Stromal proliferation about the tubules is not constant. When found it resembles embryonal spindle-cell stroma of the uterine endometrium. The glands and stroma participate in menstrual reaction as evidenced by bleeding into the stroma and gland lumina. At times large hemorrhagic cysts of similar origin are encountered in the ovary. Origin of compound tumors from this tissue is not likely for essentially the process is one of regression. In the uterus and tubes, invasion of the wall by müllerian epithelium produces local or diffuse adenomyomata and endometrial stroma may or may not surround the glands. By analogy similar tumors may arise in the ovary though none have been thus interpreted to date.

3. From the constituent portions of the normal gland (organoid). In the ovary tumors derived from the germinal epithelium reproduce simple or papillary cystadenomata. The stroma like in all adenomatoid conditions proliferates to some degree, but epithelial elements and cystic change predominate. These tumors can therefore be excluded as a source in the formation of fibroadenomata. Desmoid tumors also occur in the ovary either as diffuse fibromata of the entire organ or circumscribed nodules in the cortex. These bulge beyond the surface and by pressure cause hyperplasia of the overlying germinal epithelium. These hyperplastic conditions have been found in five circumscribed fibromata observed in the last two years. True adenofibroma represents a further step in the proliferation of germinal epithelium. The initial stimulus is the underlying fibroma with secondary invasion by hyperplastic epithelial elements from the germinal layer, resulting in the formation of an adenofibroma.

These tumors are relatively rare. Pfannenstiel illustrates such a tumor in Veit's *Handbuch der Gynäkologie*. Orthman, and Amann report adenocarcinomata as secondary degeneration in primary benign adenofibroma.

The following case report is of interest for it shows tumor formation of desmoid elements in the uterus and left ovary. The latter displays circumscribed cortical fibromata and a cortical adenofibroma.

The clinical features and pathologic findings are as follows:

CASE 1.—Mrs. R. R., aged forty-seven, was admitted to the service of Doctor Polak at the Long Island College Hospital, March 19, 1926, complaining of vaginal bleeding and pain in the lower abdomen. Menstruation began at fourteen, recurred every twenty-five days and was of five days' duration with profuse flow. Last menses were February 17, 1926. Patient has been married twenty-five years and had four full-term living children with normal labor.

On February 25, eight days after her last period, patient began to stain, passing clots and brownish material. This was associated with cramp-like pains in the lower abdomen. These symptoms persisted to the date of admission.

The abdomen presented a central tumor which was smooth, sharply defined and tender, arising from the pelvis and reaching within three centimeters of the umbilicus. Pelvic examination showed a lacerated pelvic floor with a moderate cystorectocele. The cervix was open. The uterus was enlarged to the size of a four months' pregnancy and filled the pelvis. Parametria were insensitive.

Blood Hb. was 43 per cent; W. B. C., 12,900; neutrophiles, 78 per cent; blood pressure, 142/86; phthalein, 35 per cent in two hours, and urine showed a trace of albumin and an occasional granular cast.

On March 25, 1926, supracervical hysterectomy and bilateral salpingo-oophorectomy were performed. The uterus contained a large solitary fibroid in the posterior wall.

The uterus was enlarged as a result of a solitary interstitial fibroid occupying the entire posterior wall and compressing the uterine cavity. The latter was lined by an interval mucosa except over the tumor where it displayed atrophy. On section the

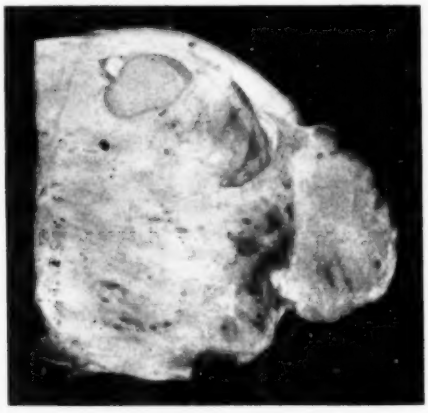

Fig. 1.—Gross specimen of adenofibroma of the ovary. Note the circumscribed kidney-shaped mass projecting beyond the cortex. The dilated gland spaces are recognizable.

tumor was soft, salmon colored, and presented diffuse thrombosis of the capsular and intratumoral veins. The tubes were grossly normal in form, shape and contour.

The right ovary was cresecntric and measured 38x28x10 mm. The surface was smooth and grey; consisteney was firm with an occasional follicular cyst presented beyond the surface.

The left ovary was heart-shaped and measured 36x30x10 mm. The medial surface presented two minute cortical fibromata averaging 4 and 5 mm. in size respectively. A larger ovoid mass presented from the free convex border measured 25x15x10 mm. On section it was compact except for minute cystic spaces, irregularly distributed between the component whorls of fibrous tissue, barely visible with the naked eye. Near the surface several hemorrhagic areas were also evident. The remainder of the ovary displayed sclerosis of the cortex and medulla. The former contained moderate numbers of follicular cysts. Vessels in the hilum were prominent.

Microscopic study of the left ovary showed the germinal layer well preserved; tunica and cortex moderately sclerotic. The minute cortical fibromata were comprised of fibrous cells with abundant intercellular collagen, and lined by three to four layers of low cuboidal epithelial cells derived from the germinal layer. The larger tumor showed whorls of fibroblasts with dense deposits of collagen between the intertwining cells. The nuclear elements were few. Scattered throughout, but

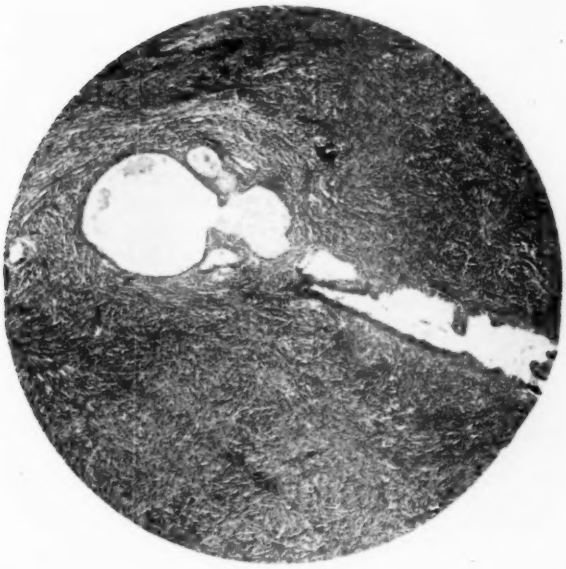

Fig. 2.—Glands of varying size supported by proliferating fibroblasts of the mixed tumor in adenofibroma.

Fig. 3.—Gland spaces enclosed in interlacing whorls of hyaline connective tissue. The calcified cells of one gland fill the lumen forming a psammoma body.

more prominent near the surface were gland spaces of varying size and contour, the majority round or oval, but large dilated forms were also encountered. The lining cells presented varying morphology, some low and cuboidal as they appear in normal germinal epithelium. Other glands were lined by cells which were definitely columnar and ciliated. Some glands showed calcareous degeneration of the lining cells which had desquamated into the lumen so that the gland presented an irregular blue body (psammona bodies). The vascular supply was furnished by moderate numbers of medium sized capillaries. At all points the tumor was sharply defined from the cortex. The remainder of the organ displayed interstitial sclerosis with follicular cysts in the cortex. Corpora albicantia were occasionally seen in the medulla. Vessels show subinvolution sclerosis.

Fig. 4.—Gross specimen of dermoid cyst in association with multiple ovarian fibromata. The central locule shows the hairs proceeding from the dermoid anlage. The upper and lower locules are solid and show the fibrous structure and interlacing fasiculi. The irregular cavities demonstrate focal necrosis of the tumors.

II

Dermoids are benign teratoid tumors of the ovary characterized by semisolid consisteney due to contained hair and sebum. The size increases with the quantity of retained secretion. A typical *anlage* is constantly found on the interior of the cyst. It contains skin, hair, sebaceous and sweat glands as ectodermal derivatives. Fat, muscle, bone and teeth are frequently encountered and are of mesodermal origin. Entodermal elements as a rule are lacking.

The association of dermoids with other tumors has been repeatedly noted. Pseudomucinous cystadenoma has been most frequently encountered. Simple serous cysts, or follicular cysts have been found.

This case is unique in the association of multiple fibromata with the dermoid. The fibroids too are unusual because of their multiplicity and their large size. Usually ovarian fibromata occur as small papillary cortical tumors projecting from the surface, or as solitary tumors diffusely involving the entire organ. In this specimen two large circumscribed fibromata surround the central dermoid cavity.

CASE 2.—Mrs. L. S., aged fifty-four years was admitted to Doctor Polak's service at the Long Island College Hospital on February 28, 1926, complaining of weakness, frequent urination and an abdominal tumor mass. Her menstruation began when she was fourteen years old and recurred regularly every twenty-eight days and lasted for five or six days. Patient was married thirty-four years and had three normal children with spontaneous labors.

Fig. 5.—Broad sheets of proliferating fibroblasts comprising the solid locules of the tumor. The pale areas represent edema.

Five years ago the patient noticed a mass in the lower abdomen about the size of an orange, which continued to grow to the size of a fetal head. Now two additional tumors are present. In the past year patient has had marked weakness and impairment of vision.

The eye grounds showed sclerosis and tortuous vessels; the retinae, areas of degeneration and subhyaloid hemorrhage in the regions of the maculae. The heart showed hypertrophy of the left chamber, mitral regurgitation and a roughening of the first sound over the aortic valve. The lower half of the abdomen was irregularly distended by multiple firm tumors reaching from the pelvis. Pelvic examination showed a senile marital introitus. Vagina was short and compressed by irregular tumor masses which were firm and insensitive, filling the pelvis.

Urine showed an occasional hyaline cast. Blood pressure was 248/126 and blood chemistry, normal. Blood count: R. B. C. 4,360,000, Hb. 85 per cent, W. B. C. 7,300, neutrophiles 61 per cent.

After two weeks' rest, laparotomy was performed under local and gas oxygen anesthesia. The uterus was carried upward by a large solid tumor of the left ovary which was incarcerated in the pelvis. The uterus itself contained multiple fibroids. Free fluid was present in the abdominal cavity. Supracervical hysterectomy and bilateral salpingo-oophorectomy were performed. Convalescence was uneventful.

The uterus showed multiple fibroids of the subperitoneal, interstitial, and submucous types.

The left tube was definitely elongated and measured 150x8 mm. It was grossly free from all other pathologic changes.

The ovary was attached by a long pedicle (12 cm.) to the outer aspect of the broad ligament, tremendously enlarged and converted into a multilobular mass, measuring 17x30x10 cm. The largest lobule was reniform and measured 17x10 cm. Externally it presented several cystic spaces bulging beyond the surface, which were

Fig. 6.—The lining of the dermoid locule is formed by epidermoid epithelium thrown into shallow waves. The corium is sclerotic. More deeply, several columns of muscle are recognizable.

reddish, translucent and averaged 4 cm. in size. The remainder was grey-white in color and the underlying veins coursed in shallow furrows. On section this lobule was comprised of edematous interlacing fibrous whorls, with foci of liquefaction necrosis. In the upper pole, a series of hemorrhagic spaces formed by trabeculae of fibrous tissue was present, varying from 2 to 12 mm. in size. The hemorrhagic zone measured 7.5x2.5 cm. Proceeding from the lower pole of the main lobule, was a second lobule, ovoid in shape and semisolid in consistency, 9 cm. in diameter, and filled with sebum and hair. The dermoid *anlage* was not pronounced. The wall of the cavity was covered by smooth thin epithelial lining. The third lobule was superimposed on the dermoid, and measured 7x3.5 cm. It presented several hemorrhagic spaces bulging beyond the surface. On section it was more homogeneous than the main tumor and comprised of finer fibrillae. The hemorrhagic surface cyst is found on section to be comprised of hemorrhagic cavities as noted in the larger lobule.

Multiple sections through both solid tumor lobules displayed essentially similar changes. The composite cell is a fibroblast coursing in large broad irregular whorls which interlace in all patterns. The large deposits of hyaline obscured the cell contour but the irregular spindle nucleus was typical. Where edema was present the extracellular products were pale and the cells spider or fusiform in shape, simulating myxomatous tissue. Such zones were more frequently encountered in the larger tumor. The hemorrhagic areas grossly noted were irregular masses of cell débris. Recent interstitial hemorrhage was present.

The dermoid locule presented in the sections studied a zone of epidermoid epithelium of the adult type. The corium was present as a broad zone of hyaline connective tissue. Sebaceous glands, hair follicles and an occasional sweat gland were encountered. A layer of muscle lay more deeply in the wall.

SUMMARY

The enclosed case reports present the clinical and pathologic aspects of adenofibroma of the ovary and combined multiple fibromata and dermoid respectively. Both were associated with fibroid tumors of the uterus. Their rarity warrants the detailed description given above.

My thanks are expressed to Drs. J. O. Polak and Archibald Murray for their suggestions in the preparation of this report.

1530 PRESIDENT STREET.

REPORT OF A CASE OF INTERSTITIAL PREGNANCY WITH WELL PRESERVED FETAL CAVITY*

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SINCE the occurrence of a pregnancy in the interstitial portion of the fallopian tube is relatively infrequent, and as the fetal cavity is generally less well preserved than in the present case, it seems worth while to record the following history, with a description and photographs of the specimen removed at operation.

The patient, a white woman, thirty-two years of age, was admitted to the New Haven Hospital, January 9, 1926. The first and second labors terminated spontaneously, but the last pregnancy in 1919 ended in a spontaneous abortion at the fifth month. The menstrual flow began at fifteen years of age, recurred every 28 to 35 days, without pain, and lasted from 5 to 6 days. The last regular period ended early in November. Uterine bleeding recurred from December 1 to 10, but the patient failed to attach any importance to the relatively prolonged flow.

At 1:30 P.M. on the day of admission, she noticed "black specks before her eyes," which were accompanied by a few dull, aching pains in the lower abdomen. Almost immediately these dull pains were replaced by a sharp pain, which was localized in the right side. At this time, the patient fainted. Upon recovering consciousness a few minutes later, she found herself lying on the floor. A physician who was summoned administered a drug, subsequent to which nausea and vomiting

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occurred. Since these symptoms were followed by difficulty in breathing, thirst, and abdominal pain aggravated by the pressure of clothing, entrance into the hospital was advised. During the first part of the trip from her home (a distance totalling twenty-one miles), she "did not seem to be aware of what was going on."

Upon admission, examination showed a fairly well nourished white woman. The skin and mucous membranes were notably pale; the extremities were cold and clammy; the radial pulse was absent; the temporal pulse, of poor quality, was 136; the systolic blood pressure was 60 mm. Breathing was irregular and shallow. The abdomen was distended; the flanks were bulging; discoloration in the vicinity of the umbilicus was absent; a fluid wave could be elicited, and upon palpation there was generalized tenderness. The pelvic examination failed to reveal external bleeding. The cervix was softened and, upon moving it, the patient complained of pain. The culdesac was bulging and crepitation could be demonstrated. Palpation of the uterus—enlarged to the size of a small grapefruit—revealed a protuberance at the right cornu. The adnexa could not be outlined. The blood count showed R. B. C. 3,072,000, W. B. C. 15,800, Hb. 55 per cent. A diagnosis was made of a ruptured ectopic pregnancy, probably associated with a uterine myoma.

As the abdomen was opened, the blue of the abdominal contents was seen through the peritoneum. The cavity contained approximately 1000 c.c. of fluid and clotted blood. The adnexa was normal, the left ovary containing the corpus luteum of pregnancy. The uterus was enlarged, the right cornu being occupied by a protuberance 7 cm. in diameter. Upon the posterior surface of the latter, there was a bleeding area 1 cm. in diameter, through which protruded placental tissue. A similar area was present upon the posterior surface of the right broad ligament. A supravaginal hysterectomy and right salpingo-oophorectomy were performed. Five hundred c.c. of saline solution were poured into the peritoneal cavity and the abdominal wall closed in layers. The anesthetic, ethylene, was taken badly, and oxygen was administered toward the close of the operation. The patient received a transfusion of 500 c.c. of blood, but since the radial pulse was still absent, and the systolic pressure failed to rise appreciably above 60 mm. a hypodermoclysis of 1500 c.c. of saline, and caffeine by rectum, were administered. Convalescence was satisfactory until the fourteenth day, when an infection developing at the upper end of the incision necessitated drainage and irrigation. Granulation proceeded slowly and the patient was confined in the hospital until the thirty-fifth day.

The right cornu of the uterus was occupied by a fluctuant protuberance measuring 7.5 × 7.5 × 8 cm., which was continuous laterally with the right tube. The ovarian ligament was attached to the lower posterior surface of the protuberance. Over the anterolateral surface and in the vicinity of the right cornu, were numerous distended blood vessels. Upon palpation, the wall of the cystic structure was very thin and just posterior to the point of entrance of the tube, there was distinct bulging. Upon the posterior wall there were two openings, one 0.1 cm., and the second 0.8 cm. in diameter, through which projected chorion and placental tissue.

Following fixation in formalin, the specimen was sectioned transversely. The uterine cavity measured 5.5 cm. in length and contained a large amount of soft, grayish-white tissue resembling decidua. The left wall measured 2 to 2.5 cm. in thickness, while the right varied between 1.75 cm. and 2 cm. in thickness. The fetal cavity contained a well preserved male fetus, whose crown rump measurement was 7 cm. The placenta was attached to the lateral uterine wall and to the posterior wall of the fetal cavity. The umbilical cord was 7 cm. in length and showed no abnormalities. Fibers of uterine muscle could be seen extending up over the top of the fetal cavity, but none were discernible upon the right side. The upper wall of the cavity varied from 2 to 3 mm. in thickness, while the lateral wall was 1 mm. or less in thickness. The lumen of the right tube could be readily seen for a distance of 1.5 cm. from the uterine cavity. (Fig. 1.)

For microscopic study, sections were taken through the tube distal to the fetal cavity, the thinned-out wall of the fetal cavity, and the uterus. The lumen of the tube was patent and free from evidences of infection. The mucosal folds were free, the surface epithelium well preserved and normal, and there was no infiltration of the underlying connective tissue.

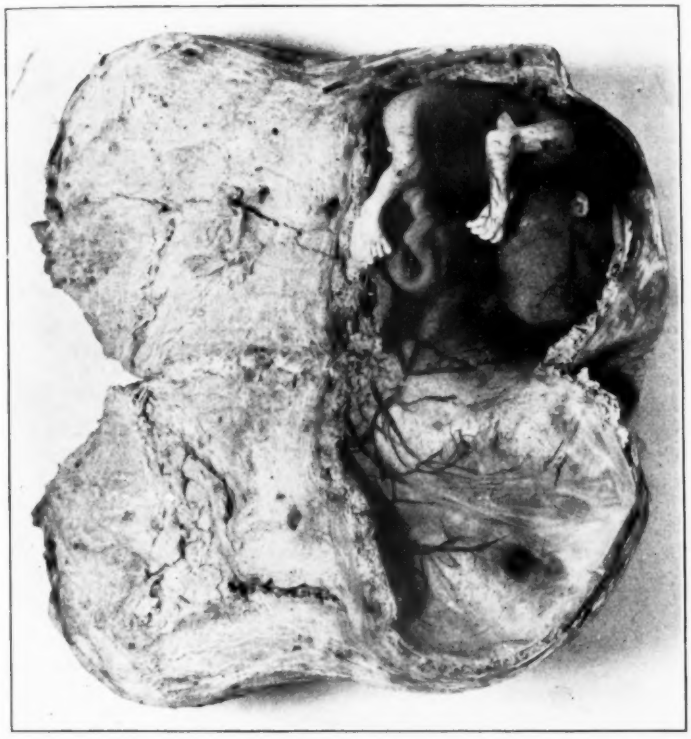

Fig. 1.—Transverse section showing fetal and uterine cavities.

The thinned wall of the fetal sac showed some edema. The muscle fibers were poorly preserved and almost the entire thickness of the wall consisted of connective tissue. This condition was particularly marked near the point of rupture.

Sections through the uterus showed that the endometrium had been converted into a structure similar to that found in cases of intrauterine pregnancy, although the spongy layer was less well developed than in the latter condition.

VISCERAL MANIKINS IN CARVED IVORY

By Le Roy Crummer, M.D., Omaha, Nebraska

THE recent communication of C. S. J. Thompson,* "Anatomic Manikins," deals with plastic representation of anatomic detail in a medium previously unrecorded in the literature.

Practically all of our knowledge of the development of anatomy, or may I say, our understanding of the penetration of the knowledge of anatomic details in the life of the people, is dependent upon the survival of plastic models fully as much as upon records left in manuscript or drawing. Attempts at proper anatomic illustration followed soon after the invention of printing, but the crude early cuts were in the main efforts to make drawings from the descriptions in the text of classic authors suitable to illustrate the context. While some earlier attempts were made, notably by Berengarius and Dryander, it was only with Vesalius that accurate drawing based directly on models became a feature of anatomic illustration. Even Vesalius recognized the objection to illustration in only two dimensions, and in the *Epitome* had his figures drawn to scale so that the separate parts might be cut out and superimposed, a method which he undoubtedly learned from the many series of fugitive sheets with superimposed flaps, which antedated his publication some five years. The devotion to dissection of the great artists of the Rennaissance indicated a desire to study form so that they might achieve perfection in painting, and with many of them, the course of endeavor was from the dissection through some form of plastic expression to the ultimate graphic representation of the human form. In Da Vinci's wonderful drawings, the effort to correctly depict the form is equal to his ability to show anatomic detail.

It is too long a story to trace the efforts made from Santorino to Fischer to substitute plastic models for charts, but each attempt is evidence of a constantly recurring desire to produce designs more suitable for purposes of instruction than could be possible with the best productions of the graphic arts. The papier-maché models of the anatomic lecture room and the jointed doll of the art class are the attenuated evidence of this fundamental idea.

Practically every form of plastic art has been used to depict anatomic detail, and almost every material has been utilized to form anatomic models, but Thompson's description of models carved in ivory is sufficient to arouse interest and warrant the description of similar figures.

*Journal of Anatomy, 1925, lix, Part 4.

Even before Thompson's article appeared, I had carefully studied the figures in the Welcome Museum, and determined, if possible, to secure one of them. I realized their extreme rarity, but felt that at least, I had one more object of medical historic interest to look for. For two vacations I kept up the quest unrewarded, but one morning I visited an antique dealer at Bale, and was delighted to be offered a copy of the 1575 Bauman Vesalius in the original binding and in perfect condition. The dealer also had a few things of historic interest in pewter, and, as was my habit, I asked him about ivory figures. Much to my surprise, he said he had a pair somewhere in the shop;

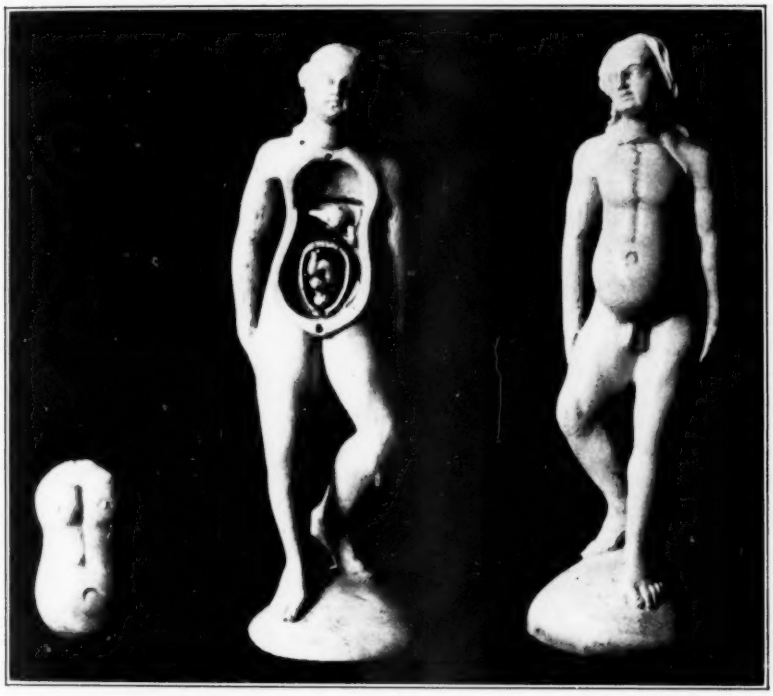

Fig. 1.—Ivory manikins 17th century. Italian workmanship.

he and his wife then began to ransack the numerous drawers in the old furniture which filled the rooms. Finally, he gave up the search, but assured me that if I would return at two o'clock, he would have the figures for my inspection. I have never been able to decide whether his search was a mere bluff because he had to send out for the figures, or whether he feared his sacred lunch hour would be disturbed. At any rate, I returned to the hotel with what patience I could muster. Just at this time, one of those sudden overwhelming thunderstorms came up which lasted until within a few minutes of my two o'clock appointment. I went back to the door of the shop, which had been flooded during the storm; the dealer, standing on a

box in the middle of the room, greeted me with a smile and handed me two ivory figures. A glance disclosed that they were different from those in the Welcome collection, and after the proper amount of bargaining, they were mine.

A careful examination showed that these figures were much more beautiful and of better craftsmanship than any in the Welcome collection. Instead of being prone, each of the figures stands erect upon a hemispheric base well carved from a single piece of ivory; each is approximately 16 cm. high; the features are finely cut; the eyes are open and the hair is brushed back from the forehead. All of the finer surface details are well carried out; there is a pleasant contrast between the rotundity of the female and the well-marked musculature of the male. The arms are not jointed as are those in the models in the Welcome collection, but extend gracefully down the sides below the hips in quite normal proportion. The figures have been carved entire and afterwards the anterior aspect of thorax and abdomen has been sawed off so that the detail carving of the viscera could be done. This carving has been carefully executed from the same piece of ivory, and in fact, some of the organs have been carved in situ. This method of carving was fortunate since in the course of time many of the parts not firmly attached have been lost.

In the male figure, there is a groove indicating the position of the diaphragm and above this groove is the spherical heart attached by a small piece of tape to the upper portion of the thorax. Below the groove is the spleen and both kidneys with blood vessels and ureters. Quite out of proportion is an immense bladder with wings. All of these organs except the heart have been carved in position and are attached to the posterior wall of the abdomen. The vena cava is represented by a strand of some dark material in proper anatomic position.

In the female figure, there is also a groove for the diaphragm, but the heart as well as the lungs is missing. Below the groove is a retort-shaped stomach, kidneys, and spleen with the proper blood vessels. The uterus is shown enlarged halfway from the umbilicus to the ensiform cartilage. The fetus is freely movable and is a piece of most delicate carving; a piece of red silk thread serves as the cord and connects the fetus with the placenta which is located in the vault of the uterus. Either by accident or design, the fetus is in the characteristic "See No Evil" posture and is in the left occipitoanterior position with head downward and the face directed to the right. To the sides of the lower pole of the uterus are seen the uterine horns of pre-Vesalian anatomy. A small metal peg in the lower part of the uterus indicates that at some time there had also been the cup-shaped anterior wall of the uterus.

Traces of pigment can still be seen arranged in definite lines on the

back of the ivory flaps which probably were meant to represent the course of the blood vessels. The lungs, diaphragm, liver, and intestinal coils are missing in both figures. These were probably all loose pieces which had to be fitted in carefully and so have been lost. The carving of the visceral organs is very delicate; the proportions are fairly accurate, but the anatomic errors are the same as shown in the early anatomic fugitive sheets which undoubtedly were the models for this pair of manikins as well as for those described by Thompson.

The attitude and facial expression of these figures seemed strangely familiar, and some time later, glancing at the title page of my 1604 edition of Vesalius, the reason for the association struck me. This famous title page, engraved by Valegio, is divided into six compartments; in the lower corners are represented the male and female torso, open to the viscera. My ivory figures are so similar in hairline, poise of head, facial expression, and shape of trunk that Valegio's engravings must have served as a model for the figures, with the reversion not uncommon, even in the illustrations of that period, to the pre-Vesalian anatomy of the fugitive sheets in representing the shape and position of the viscera. This association rather definitely indicates that these figures must be of Italian seventeenth century workmanship.

The function of these carved ivory manikins is but little known or understood, since there are few references to them in either the history of anatomy or of art. Mr. Thompson, at the conclusion of his article, definitely ascribes them to teaching purposes, upon the authority of a document found in a case containing a pair of these figures, which stated that they had been used for teaching barber surgeons so they might know as much pelvic anatomy as the midwives. This document, however, was dated 1786, and whether this was the function of the manikins a century and a half before is difficult to determine. To me, it seems more probable that these ivory manikins were rather an expression of the constantly recurring idea of the advantage of models over prints, and an example of the effort recurrently made to devise various anatomic representations in plastic rather than graphic art.

But any such matter of fact conclusion may be upset by a trivial bit of information derived from the persistence of superstition in primitive medical folklore. I have shown these figures to numerous friends, both professional and lay, with no other reaction than an expression of curiosity, but recently, a visitor gave me a clew which offers another explanation. She told me that when a bride in 1865, she attended a course of popular lectures on the physiology of pregnancy for young married women, and that the demonstrations were based upon ivory figures such as these; so even as late as the early Victorian period, these figures were used in pseudoscientific teaching, and this survival indicates a similar use in the earlier period.

THE RELATION BETWEEN CELIBACY IN WOMEN AND DEFECTIVE PELVIC ORGANS*

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With a Note by Raymond Pearl, Ph.D., Johns Hopkins University

THERE must naturally be many causes for celibacy in women, such as economic pressure (the need for helping dependent relatives, or the inability of a prospective husband to support two or three people); the quite excusable fastidiousness which comes with a higher education and an economic independence; the death of a first love, and so forth, but any physician of experience must have noted how frequently the unmarried woman of mature years is found to have some pelvic disease or some signs of hypogonadism, conditions which have probably made her less willing, or less able, to enter the married state.

As will be seen later, most of these women seem eventually to find mates, so that there are any number of sexually unattractive "old maids" among the married. Furthermore, there are many beautiful women who are frigid and anesthetic apparently for psychologic reasons, just as there are many unattractive ones with diseased pelvic organs who are sexual enough to secure one indulgent husband after another.

Under such circumstances no conclusions should be drawn from the impressions which are left in one's mind by striking cases, but the problem should be attacked statistically. An opportunity to do this came recently while we were studying the relation between hypogonadism and hypertension. We then had occasion to divide the case histories of 1,227 women (office patients of one of us) into three groups designated: sexually normal, sexually abnormal (+), and sexually abnormal (++). The second group included all those who had or had had abnormal menstruation, fibroids, an infantile type of uterus, badly cystic ovaries, a masculine distribution of hair, sexual anesthesia, or thyroid disease. It included also those who had suffered the removal of a diseased uterus or defective ovaries. As some of the cases were on the borderline and hard to classify, the third group (++) was made to include those who were certainly abnormal and of the type that would interest an endocrinologist.

It can be seen from Table I that of the 1,227 women, 46.8 per cent were normal, 41.7 per cent were +, and 11.5 per cent were ++. Twenty-

*Work done at the George Williams Hooper Foundation for Medical Research, University of California Medical School.

TABLE I

PERCENTAGES OF SINGLE, MARRIED AND DIVORCED WOMEN

GROUP	NORMAL			ABNORMAL						TOTAL	
				+			++				
	CASES	PER CENT OF		CASES	PER CENT OF		CASES	PER CENT OF		CASES	PER CENT
		NORMAL WOMEN	TOTAL WOMEN		ABNORMAL (+) WOMEN	TOTAL WOMEN		ABNORMAL (++) WOMEN	TOTAL WOMEN		
Single	134	23.4	40.3	146	28.0	44.2	52	36.0	15.5	332	27.0
Married and widowed	412	72.0	48.7	347	68.0	41.0	86	60.0	10.3	845	69.0
Divorced and separated	27	4.6	54.0	17	4.0	34.0	6	4.0	12.0	50	4.0
Totals	573		46.8	510		41.7	144		11.5	1227	

seven per cent were single; 69 per cent were married, and 4 per cent were divorced or separated.

Fig. 1 shows that the percentage of married women, as we expected, decreases rapidly as one passes from the normal to the + and ++ groups. The percentage of single women rises accordingly, and the percentage of separated and divorced women remains practically the same. The two lines in the center of the graph show that among the

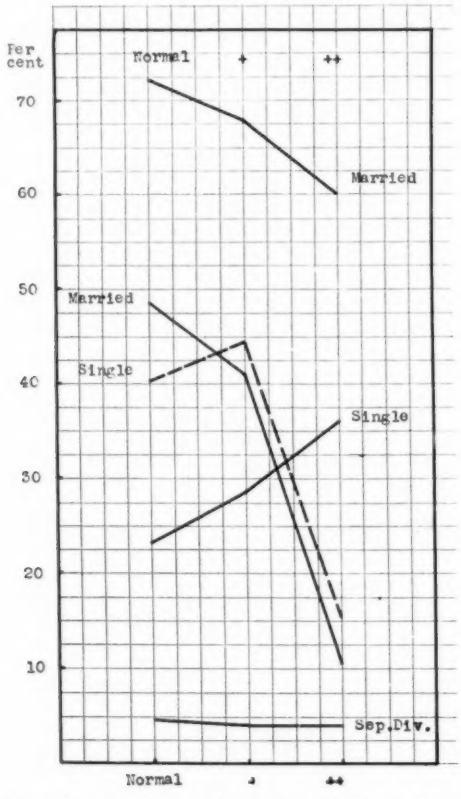

Fig. 1.—The percentages of married, single and divorced women in the three classifications: sexually normal, sexually abnormal (+), and sexually abnormal (++). The two lines in the center of the graph show the percentage distribution of all married and all single women within the three classifications.

married, some 50 per cent are normal, some 40 per cent are +, and 10 per cent are ++. Of the single women about 40 per cent are normal, 45 per cent are +, and 15 per cent are ++.

In Table II and Fig. 2 the women have been divided into four age-groups to bring out the fact that the big difference in nubility comes in the early years. Most, even of the sexually deficient, eventually get married, but those with poor pelvic organs either choose to wait or are compelled to wait until their more sexual sisters have taken

their pick of the available men. They appear to be handicapped during those years when sexual attractiveness is the important factor. Later, when marriage is contracted more soberly for companionship or home building, they seem to be able to hold their own with the widows.

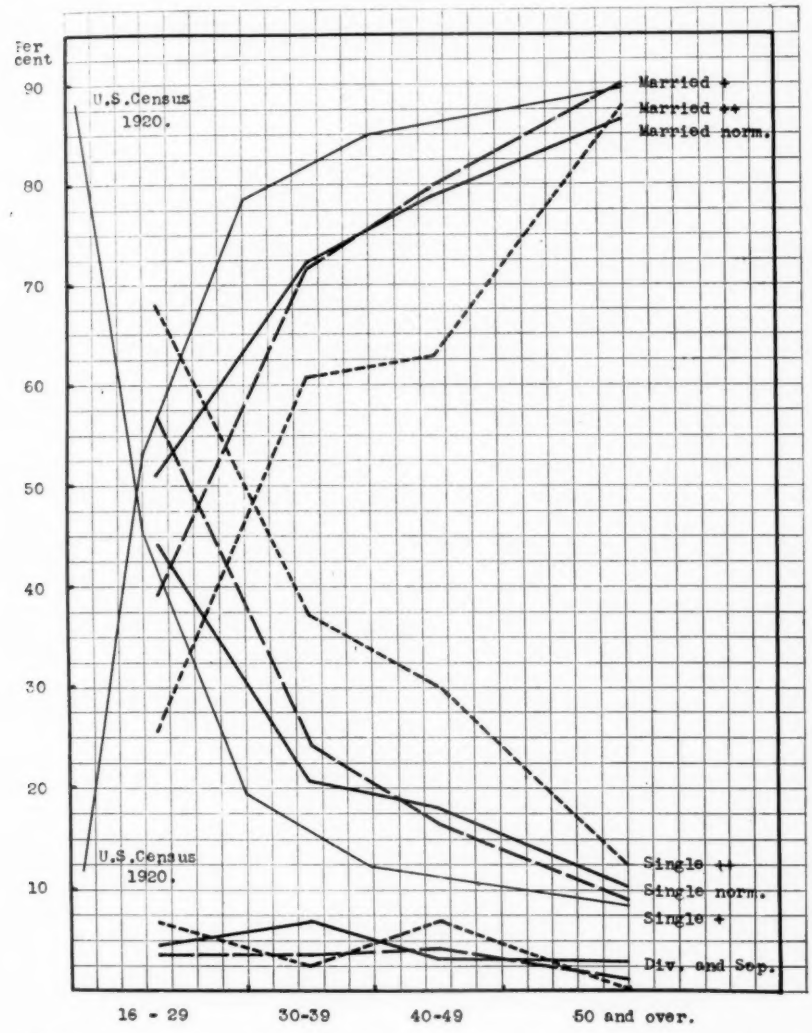

Fig. 2.—The division of women by per cent into single, married, and divorced groups at the different ages. The slowness of the sexually deficient to get married in the earlier years is shown. The fine line represents figures from the United States Census for 1920, and shows the relative proportion of single and married women in California.

Fig. 2 shows that in California some 9 per cent of the women over fifty are single. Unfortunately, it does not show how many of the young women starting out in life stay single; how many move over into the married group, and how many die. It would be interesting

TABLE II

PERCENTAGES OF SINGLE, MARRIED AND DIVORCED WOMEN ACCORDING TO AGE-GROUPS

GROUP	AGE, YEARS	SINGLE			MARRIED AND WIDOWED			DIVORCED AND SEPARATED			TOTALS	
		CASES	PER CENT OF TOTAL SINGLE WOMEN	PER CENT OF TOTAL WOMEN OF THIS AGE	CASES	PER CENT OF TOTAL MARRIED WOMEN	PER CENT OF TOTAL WOMEN OF THIS AGE	CASES	PER CENT OF TOTAL DIVORCED WOMEN	PER CENT OF TOTAL WOMEN OF THIS AGE	CASES	PER CENT OF TOTAL WOMEN IN THIS GROUP
Sexually normal	16-29	66	49.3	44.3	76	18.4	51.0	7	26.0	4.7	149	26.0
	30-39	32	23.9	20.6	112	27.2	72.3	11	40.7	7.1	155	27.0
	40-49	20	14.9	17.9	88	21.4	78.5	4	14.8	3.5	112	19.5
	50+	16	11.9	10.2	136	33.0	86.5	5	18.6	3.2	157	27.5
	Total	134		23.4	412		72.0	27		4.6	573	
Sexually abnormal (+)	16-29	78	53.5	57.4	53	15.3	39.0	5	29.4	3.6	136	26.7
	30-39	40	27.4	24.4	117	33.7	72.0	6	35.2	3.6	163	32.0
	40-49	20	13.7	16.5	95	27.4	79.5	5	29.4	4.2	120	23.5
	50+	8	5.4	8.9	82	23.6	90.0	1	5.9	1.1	91	17.9
	Total	146		28.0	347		68.0	17		4.0	510	
Sexually abnormal (++)	16-29	21	40.3	67.6	8	9.3	25.8	2	33.3	6.6	31	21.6
	30-39	14	27.0	37.0	23	26.8	60.5	1	16.7	2.5	38	26.4
	40-49	13	25.0	30.3	27	31.4	62.8	3	50.0	6.9	43	29.9
	50+	4	7.7	12.5	28	32.5	87.5				32	22.1
	Total	52		36.0	86		60.0	6		4.0	144	

to know the number of women who remain celibate all their lives and the number who do so on account of poor pelvic organs. The problem is complicated somewhat by the fact that there are no good statistics regarding the comparative mortality of the single and married.

In the report on the Vital Statistics of New York State for 1909-1911,[3] it is stated that the mortality of the spinsters was half again as large as that of the married. That is what might be expected from the fact brought out by this study that the spinsters have more hypertension and more pelvic disease, conditions which, with their sequelae, can shorten life. This great mortality among spinsters is not so marked, however, in Scotland, where Dunlop could demonstrate it only by subtracting from the mortality rate of the married that fraction due to the accidents and sequelae of childbirth.

We appealed to Dr. Pearl for a method with which to estimate the probability at any age of a woman's remaining single, and he very kindly sent us the following information. The problem is complicated on account of the lack of basic data. He writes: "If the 1_x or number of survivors of age x in a life table population is multiplied by the proportion of single persons at that age in the actual population, the product B_x represents the number of single persons aged x in the life table population. If the sum of the d_x's for a given age-group is multiplied by the proportion of single persons in that age-group in the actual mortality statistics, the product θ_x represents the number of single persons dying in that age-group in the life table population, and the sum $\sum_{x}^{\omega} \theta_x$ is the number of persons dying unmarried at the age x or above. The probability of a person aged x dying unmarried is therefore $\sum_{x}^{\omega} \theta_x / B_x$.

"A life table for California females is given in the United States Abridged Life Tables for 1919-1920 (Washington, Government Printing Office, 1923) and the proportion of single women in the different age-groups of the living population is given in the 1920 Census. As I could find no data for the percentages of single among deaths in California, I assumed that they were in the same ratio at each age to the percentages for Massachusetts, which are tabulated, as the corresponding percentages for the living in the two states. As the different quantities used were tabulated for different age-intervals I have reduced them to the same interval by graphic interpolation (Table III)."

It will be noted from Table III that the probability of a young woman, between fifteen and nineteen, remaining single is 1:10. Of the 267,635 single women in California in 1920, 64.6 per cent were between sixteen and twenty-nine years of age; 16.4 per cent were between thirty and thirty-nine; 9.6 per cent were between forty and forty-nine, and 9.4 per cent were over fifty. Conditions in this state,

TABLE III

PROBABILITY OF A CALIFORNIA FEMALE DYING UNMARRIED

AGE, YEARS	PER CENT OF FEMALE POPULATION SINGLE*		RATIO, CALIFORNIA TO MASSACHUSETTS	PROPORTION SINGLE IN MASSACHUSETTS DEATHS	PROPORTION SINGLE IN CALIFORNIA DEATHS	CALIFORNIA† d_x CUMULATED	ESTIMATED SINGLE DEATHS	CUMULATED	PROPORTION SINGLE IN CALIFORNIA POPULATION AT BEGINNING OF AGE GROUP	l_x	ESTIMATED LIVING SINGLE	PROBABILITY OF DYING SINGLE
	CALIFORNIA	MASSACHUSETTS										
15-19	88.0	95.0	.926	.902	.835	1,710	1,428	8,612	1.000	88,920	88,920	.10
20-24	45.2	62.7	.721	.525	.379	2,460	932	7,184	.62	87,210	54,070	.13
25-34	19.4	30.6	.634	.242	.153	5,600	857	6,252	.30	84,750	25,430	.25
35-44	12.2	19.9	.613	.197	.121	5,590	676	5,395	.15	79,150	11,870	.45
45-54	10.5	17.3	.607	.186	.113	7,460	843	4,719	.11	73,560	8,092	.58
55-64	8.4	15.9	.528	.160	.084	12,020	1,010	3,876	.080	66,100	5,288	.73
65+	5.5	13.1	.420	.126	.053	54,080	2,866	2,866	.053	54,080	2,866	1.00

*14th Census, Vol. ii, chapt. 4, Table II.
†U. S. Abridged Life Tables, 1919-20 (graphic interpolation).

however, are somewhat abnormal, on account of the large influx of elderly people.

The two fine lines in Fig. 2 represent data from the 1920 census for California. The location of these lines suggests that even our sexually normal patients were a little slow in getting married, but that is probably due to the fact that for the most part, their social, educational, and financial statuses were above the average for the state.

There can be little question that sexual anesthesia and hypogonadism account for a good many divorces, and we observed a number of instances of that during this study. It does not show up statistically, however, because in Table II one finds no preponderance of + and ++ cases in the fifty divorced and separated women. Often, of course, the trouble is due to the husband, as in one of our cases where an attractive young woman confessed to having had two divorces. Under these circumstances we rather expected to find a history of frigidity or bad temper, but we found instead that she had turned against the first husband for giving her syphilis and against the second for giving her gonorrhea.

In passing, it might be of interest to note that in a number of cases sexual anesthesia was plainly a family trait. Thus, a woman who had been deserted on account of her anesthesia brought in her fine-looking daughter to see if something could be done to correct her repugnance for any signs of affection on the part of her admirers. The grandmother admitted that she had almost lost her husband on account of the same difficulty. In another family three sisters found their sexual lives very repugnant to them, and we suspect that their father's desertion of their mother was due to the same cause.

There are two cases in our series which indicate that the anesthesia can persist as a physical defect even when the psychic reactions are favorable. In both instances the women were finely built and attractive in every way. One, to please her family, was married at sixteen to a man of fifty; the other married a man she did not love in order to spite the man she did want. One does not wonder that anesthesia was present under these circumstances, but the interesting point is that it was just as bad later when these women had illicit relations with men to whom they were devoted.

This whole problem of intermediate or borderline sexuality in women is a most important one as the victims so often are unhappy, poorly adjusted, wondering what the trouble with them can be, and turning for help to a profession which so far has devoted little thought or attention to the problem. When one succeeds in getting the confidence of these women and when one gets them to pour forth the questions which have been uppermost in their minds, one often finds that they have gone from one physician to another with some vague complaint, really hoping to find some man to whom they could talk.

Why their repugnance for something that their normal sisters can enjoy; and why the barriers between them and maternity and the other phases of married life which they crave? These are the questions that crowd forth, and these are questions to which the profession must try to find answers. Those who have the requisite cleanliness of life and mind and face to invite these confidences must take time to draw these women out. They must learn to make their confessions easy for them, and they must help them so far as they can to understand the situation and to adjust themselves to it.

Much must be done to educate the mothers of the land and especially the anesthetic ones so that they will not pass on to their daughters a repellent, terrifying or disgusting idea of the sexual life. Something perhaps may also be done through the education of the men. That the problem is an important one can be seen from the fact that 16 per cent of the 1,000 women, who answered a questionnaire sent out by Davis, stated that their sexual life was indifferent to them and another 10.4 per cent that it was actually distasteful.

SUMMARY

A study of 1,227 women shows that in the early years of life, before the age of thirty-five, there is a relation between defective pelvic organs and celibacy. These defects interfere with marriage during the years when sexual attractiveness is important. Later, they seem to have little effect.

Pearl has worked out the probability of a women of age x dying single; for ages between fifteen and nineteen it is about 1:10.

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THE RESPIRATORY EXCHANGE OF THE FETUS

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THE nutrition of the fetus depends mainly upon the types of food it receives and upon its own peculiar metabolism. The evidence at the present time indicates that protein in the form of amino-acids, and carbohydrates, pass the placental membrane by simple diffusion from mother to child, while fats and their derivatives, the lipoids, do not traverse this partition, but that the fetus manufactures its own fat, and most probably wholly from carbohydrates. Slemons[1] has given an excellent account of the experimental work up to 1919. Since that date, Tyler and Underhill[2] have corroborated the results of Slemons and Stander[3] on fetal fat metabolism. More recently, Wesson,[4] by placing different groups of rats on diets containing different percentages of highly unsaturated fatty acids and analyzing for these in the fetuses, also came to the conclusion that the fetus probably synthesizes the fatty acids.

From the evidence referred to above, as well as from the work of Ahlfeld,[5] Oshima,[6] Murlin and Bailey,[7] Gage and Gage[8] and Mendel and Daniels,[9] it seems well established that the fetus must synthesize its own fat. Thiemich[10] also concludes that in the dog the fetus does not derive its fat from the mother, although he later modified this view on the basis of another experiment, believing that the fetus derived a portion of its fat, at least, from the mother. Hofbauer,[11] on the other hand, concludes that fats are transmitted from mother to fetus, but one must agree with Wesson,[4] in his critical review, that Hofbauer's results appear to be of an inconclusive nature.

Believing then, that the fetus derives its amino-acids and carbohydrates from the mother and that it synthesizes its own fat, probably from carbohydrate, it becomes important to study the respiratory exchange of the fetus. We know from the work of Cohnstein and Zuntz[12] that oxygen and carbon dioxide pass the placental membrane according to the laws of diffusion. Bohr[13] showed that in the guinea pig, in the later stages of pregnancy, the fetus has a respiratory exchange as high as that of the mother, and further demonstrated that the fetal respiratory quotient is unity, indicating that carbohydrates are the source of its energy. Murlin,[14] working on newborn puppies, came to the same conclusion. Russell and Woglorn[15] determined the respiratory quotient of minced embryonic tissue and found it to be unity.

It occurred to us that the respiratory quotient of the human fetus could be determined were one able to procure samples of arterial and venous bloods from the umbilical cord before the child started breathing.

The technic developed for obtaining these blood specimens is as follows: In a spontaneous delivery of a normal multipara where no anesthesia is necessary, the cord is clamped with two Kelly clamps close to the body of the child as soon as it appears at the vaginal outlet, and *before* the child breathes. Two clamps are also immediately applied as close as possible to the placental end of the cord. By now cutting the cord between the clamps applied at the one end as well as between those at the other end, one obtains a piece of cord usually about twelve inches in length, tightly clamped at either end, and containing enough venous and arterial fetal blood for a complete gas analysis. The blood specimens are obtained by means of a needle and syringe containing about 2 c.c. of paraffin oil. The blood samples are immediately transferred to a small bottle containing paraffin oil and a sufficient amount of sodium oxalate to prevent clotting. Both venous and arterial blood specimens are at once analyzed for oxygen and carbon dioxide content. In all the analyses, I have used the constant volume, closed manometer, Van Slyke apparatus, and have followed the technic of Van Slyke and Neill.[16]

The oxygen and carbon dioxide contents are expressed as volumes per cent. It is evident that the difference in oxygen content between the arterial and venous blood represents the amount of oxygen utilized by the fetus, and similarly that the amount of carbon dioxide produced by the child is the difference in carbon dioxide content between the venous and arterial blood. We may then write:

$$\text{R. Q.} = \frac{\text{A}}{\text{B}},$$

where R. Q. = Respiratory Quotient,

A. = Difference in carbon dioxide content of venous and arterial bloods, and

B. = Difference in oxygen content of arterial and venous bloods.

The results reported in Table I are in cases where labor was easy and with no apparent asphyxia in the child, and where the mother received no, or exceedingly little, anesthesia. In order to further safeguard against the effect of asphyxia, I studied the respiratory quotient of the fetus in two cases of cesarean section. In these experiments, the cords were clamped and cut in the same manner as described above, immediately after the incision of the uterus and before the child breathed. The findings are given in the latter part of Table I. To determine the effect of ether on the respiratory quotient, some experiments were performed on dogs. Using the apparatus already described[17] for estimating the heart output, I determined the respiratory quotient in two normal female animals without and with anesthesia, respectively. The results are given in Table II.

A further experiment was done on a pregnant dog at term and probably in labor. The animal's respiratory quotient was determined; it was then anesthetized, an abdominal incision made, the uterus exposed, and blood specimens obtained from the uterine artery and vein.

TABLE I

R. Q. OF HUMAN FETUS

WEIGHT IN GM.	SEX	CONDITION	R. Q.	REMARKS
2980	Male	Good	1.21	Normal spontaneous delivery
3200	Male	Good	1.11	Normal spontaneous delivery
3420	Female	Good	0.92	Normal spontaneous delivery
2860	Female	Slightly asphyxiated	1.00	Normal spontaneous delivery
3620	Male	Good	0.97	Normal spontaneous delivery
3480	Male	Good	0.90	Normal spontaneous delivery
3690	Male	Slightly asphyxiated	0.99	Normal spontaneous delivery
3145	Female	Good	1.25	Normal spontaneous delivery
4100	Male	Good	1.11	Normal spontaneous delivery
2980	Female	Slightly asphyxiated	1.05	Cesarean section
3240	Female	Good	1.04	Cesarean section

TABLE II

THE EFFECT OF ETHER ON THE R. Q.

DOG	WEIGHT	BREATHING PERIOD	CONDITION	R. Q.
No. I	11 kg.	3 minutes	Unanesthetized	0.86
No. I	"	4 minutes	Under Ether	0.97
No. II	13.4 kg.	4 minutes	Unanesthetized	0.82
No. II	"	4 minutes	Under Ether	0.90

These blood samples were immediately analyzed for oxygen and carbon dioxide. While the dog was still under ether, its R. Q. was again determined. I also attempted to obtain samples of arterial and venous blood from the individual cords of several of the puppies. Great difficulty was here encountered because of the size of these vessels, but in one instance enough blood was obtained for a single set of determinations. The animal was then delivered of nine living puppies, all in good condition. The results were as follows:

Mother's R. Q. before ether anesthesia = 0.74
Mother's R. Q. under ether anesthesia = 0.79
Pup's R. Q. calculated from uterine vessels = 0.90
Pup's R. Q. calculated from cord vessels = 0.93

From these findings, as well as those reported in the tables, it appears that the respiratory quotient of the fetus approaches unity. We have studied and endeavored to eliminate the effect of anesthesia and asphyxia on the respiratory exchange of the child.

The work of Porges and Novak[18] and Harding[19] teaches us that a diet poor in carbohydrates leads to an excretion of acetone bodies in the urine in a normal pregnant woman, whereas this is not the case in a nonpregnant person. The excretion of these substances can be suppressed by adding carbohydrates to the diet. The experiments of Bohr,[13] of Lochhead and Cramer[20] and of those already referred to in this paper, show the great importance of carbohydrates for the development of the fetus. Our results are further evidence that the fetus uses, at least at the end of pregnancy, carbohydrates as its source of energy.

What effect labor may have on the respiratory quotient of the fetus is not known, though it is probably negligible. Some light may possibly be thrown on this problem from studies which we are at present conducting on the respiratory exchange of the mother before, during, and after labor.

SUMMARY

The experimental evidence at present indicates that amino-acids and carbohydrates pass the placental membrane from mother to child, whereas fats do not; that the child most probably synthesizes its fat from carbohydrate; and that the fetus utilizes carbohydrates as its source of energy.

CONCLUSIONS

1. The human fetus has a respiratory quotient of approximate unity.

2. Ether anesthesia and asphyxia do have an effect on respiratory quotient determinations in the fetus, but this effect may be eliminated or fairly well evaluated.

.3 From a study of the respiratory quotient of the child at the time of delivery, it appears that it utilizes carbohydrates as the source of its energy.

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FUNCTIONAL DISEASES OF THE FEMALE GENITAL ORGANS

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IT IS to be expected that as civilization changes, new disharmonies should arise in man that are of great importance to the physician. In a natural system, such as that under which the lower animals exist, disharmonies are constantly weeded out by natural selection, until the animal becomes better and better adapted to his environment. In man, however, biologic evolution has ceased completely, for man has at his command a tool, the intellect, which enables him to mold his environment artificially and to fashion it according to his needs and desires. Hence we have the phenomenon of an increasing complexity of social institutions in which man, just because he is biologically static, could not live without long youth and special training.

We repeat that men, unfortunately for their physical well-being, do not adapt their social environment to their biologic needs. Moreover, as they are endowed with mental powers forever seeking something novel, new needs and desires, artificial from a biologic point of view, come into existence and necessitate the suppression of natural ways of living. But for every compromise of this sort, a subsequent disharmony is inevitable. For in a natural environment man would employ all his organs according to their structure and biologic purpose; socially, however, such an instinctive life is impossible, and this gives rise to very grave problems of a medical and sociologic nature.

This paper shall present a study of a particular example of sexual disharmony, which is caused by the fact that women, under the existing order of social life, are prevented from permitting their sexual organs to function in accordance with their structural purpose. This is due in part to the change in standards of social morality, and in part to the necessity and opportunity for women to seek employment of an industrial nature.

Our problem is to be a study of endometritis in its varying forms, and the thesis which we shall advance is that in many cases of so-called endometritis we must take into consideration such social factors as woman's place in industrial life and the consequent sexual disharmony as being of chief importance in the diagnosis.

A disease may present an extremely clear etiology of structural impairment, with a resulting disturbance of function. On the other hand, the organ may be unaffected originally, and the cause of the disease originate with the disturbance of the function of that organ. Now, when we have a disturbance of function as the starting point of a disease, we must expect to find per se a social situation.

This fact is generally lost sight of in gynecologic problems. Heretofore disorders due to reflex action have not been thoroughly analyzed. They have been attributed to misplacement of the uterus and adnexa, and some method or other of uterine fixation was unhesitatingly adopted. But since these disturbances are subject to relapse, and the operations are not of permanent benefit, all these more or less violent methods of treatment would seem to be far from ideal.

The truth is that, in view of the historic development of gynecology, and in view of our deep-rooted respect for internal medicine, a symptomatic therapy receives sole consideration. The brilliant development of operative gynecology and x-ray naturally directs the gynecologist's attention towards the diseased female organs rather than to the woman herself as a social creature. But after a consideration of the status of women today, and her consequent maladaptation to the social environment, we must realize that many gynecologic clinical pictures call for reinterpretation. For this reason, we should aim not at a therapy of an operative nature, which results in a climacterization, or matronization, of the patient, but we should rather direct our attention, in those cases which obviously imply a social disharmony, to a rejuvenation of the patient by a readjustment of her life wherever this is possible.

We shall consider the various forms of metropathy from this standpoint of functional disturbance occasioned by social factors. In spite of many discussions concerning endometritis, metritis, metroendometritis, etc., the diagnosis as such is still obscure. As long as we could construe clinical phenomena as the typical anatomic diagnosis of metritis and endometritis, we felt that we had a tolerably satisfactory conception. But when these terms are applied to disturbances of the genital organs which originate in the distortion of sexual functions due to artificial social life, we are at sea. We find that the distinction between metritis and endometritis proves to be, in the main, nothing but the successive stages of the normal cycle of menstruation distinguished by its progressive and retrogressive changes. In addition, since neither the relative measurements of the uterus, nor its consistency, nor the growth or increase of the connective tissues, nor vascular changes, can any longer be looked upon as characteristic of metritis, the confusion becomes greater than ever.

We feel that this confusion is dispelled by a division of so-called endometritis into two groups. The first group contains those cases whose etiology is clear, where we can readily ascertain the causes of the pathologic conditions of the endometrium and of the myometrium. This is the form induced by gonorrhea, sepsis, tuberculosis, and other inflammations due to microorganisms. Along with these etiologic factors may also be classed local irritants consisting of retained products of conception. This form of endometritis is clearly brought about by a local irritant and is attended by the three cardinal symptoms of all female

diseases; namely, discharge, hemorrhage, discomfort and in some cases also by pain. The method of treatment is clearly indicated: Removal of the local cause, which if successful will effect a speedy cure. This is best seen in the least questionable form; namely, in endometritis after a simple abortion, when a removal of the products of conception leads to a quick and complete return to health. To this group, whose cause, as can be proved, is local irritation, the term "endometritis" is applicable, and should be applied to this group exclusively. We may also (here) employ the term "metroendometritis" to denote an irritation occurring in the mucosa of the uterus and the muscularis, and often accompanied by real inflammation (lymphocytes, plasma cells, etc.), which may further lead to hyperplasia. In such cases everything is clear; cause, effect and treatment, and therefore we can apply to this group a specific and definite terminology. Such cases have been scientifically established and are well-nigh closed to further investigation.

It is to the second group that we shall direct our attention. This is the group which we feel involves in its etiology the sexual disharmonies resulting from the social maladaptation of women. To this group we shall apply the very indefinite and general term "metropathy," for here our ground is not so clear. The discussion of metropathy must involve, if we would dispel many of the confusions that exist, a study of woman's sexual life as it is affected by modern civilization. In our discussion we shall not consider the asthenic individual who, because of her chromosomal deficiencies, shows throughout the reproductive period —from menarche to menopause—psychic contradictions and catastrophies. Nor shall we take into consideration other constitutionally defective individuals, to whom the carrying out of even normal sexual functions is pernicious. We shall limit our analysis to the disturbed functions of women who are practically normal in all other respects.

We are led to our distinction between endometritis and metropathy by observing that there is a second group classified as endometritis, which, however, presents a symptom-complex different from that in the first group which we have briefly discussed. In this second group, metropathy, there are, of course, the typical discharge and bleeding, but along with these we find a severe discomfort and a more or less disturbed condition of the lower abdomen, in fact, of the whole organism, physical and psychical. While a search for a local cause in the mucosa and the myometrium will occasionally reveal hyperplasia and degeneration, the findings are not really convincing. Indeed, the histologic findings in the mucosa, the myometrium, even in the ovaries, etc., present such varying aspects that one no longer cares to call them characteristic. But a comparison of such conditions with those manifest in senile endometritis throws a light on this matter. To be more explicit, this climacteric form (senile endometritis) attended with discharge and often with

hemorrhage, is attributable to the cessation of the inner ovarian secretion, and the consequent circulatory and trophic disturbances.

This phenomenon appears more frequently and is far more severe when an artificial menopause is brought on abruptly and prematurely, whether by the pernicious x-ray treatment or by the surgical removal of the ovaries. This process has its basis in the complete dependence of the endometrium upon the whole organism and its chromosome functions, and in the relations existing between the ovarian function and all other internal secretions. Now the cause of the second form of endometritis or metropathy is found in these same basic conditions and relations, as will be explained further on.

To continue: In both stages of life, in puberty as well as in the climacteric period, we find functional disturbances, irregular, that is to say, excessive or scanty bleeding and leucorrhea. Such disorders may be due in part to local causes found in the uterus and in the undue proportion between the musculature and the connective tissue and in part they may result from the dysfunction of the whole organism in not being properly adjusted to the required production of blood and secretion.

In developing my opinion at length, I shall be guided by the main symptoms of functional disturbances; namely, irregular bleeding and discharge. These symptoms stand in definite relation to the sexual functions and have their root there. For this reason I would characterize the x-ray treatment as pernicious, since it so seriously interferes with these functions. The gynecologist, moreover, can no longer shut his eyes to the fact that the basis on which woman develops her womanhood and her feeling of individuality is, in the main, her sexual life, and that she therefore, cannot afford to have the menopause brought on prematurely. To resume: The menstrual bleeding is a sign that an ovum is destroyed. The graafian follicle and ovum must be completely removed in order to make room for the next follicle and ovum. Therefore, we define menstrual disorders as the outer expression of irregularities in the destruction of one nest and the subsequent formation of another. Now, between two periods there should be no bleeding, yet there is, at times, a normal hypersecretion from the uterine and the cervical glands. A certain amount of fluid is essential in the cervix, in the uterus, in the abdomen, and in the fallopian tubes so as to enable the spermatozoa to move upward toward the tube and the ovum to move downward and thus effect a meeting of the two.

It is evidently a fact that in every sexual stimulation, direct or indirect, there is an inundation, or at least a thorough moistening of the genital tract. Thus the secretion from the uterine glands is a function of the female to further, to a certain extent, the motility of the spermatozoa. During menstruation, bleeding and glandular secretion are not separable, and it is a mixture of these elements in varying proportions

that form the menstrual flow. Thus regular bleeding during menstruation and a moderate amount of glandular secretion during both menstruation and cohabitation, may be looked upon as the functional expression of normal female sexual life.

When any disturbances occur in woman's sexual life, the whole organism is liable to become upset and to suffer. That, moreover, many women have to undergo such sufferings is evidently true, although we can give no reliable statistics. This number, however, must be great, judging by the many cases physicians come in contact with every day, and taking into account the many women who, assuming as a matter of course, all kinds of sex discomfort and sex disorders, bear these without uttering any complaint. It needs only a knowledge of the great amount of patent medicine sold to women for such ailments to make us realize how large is this class of sufferers. But to continue: A woman's reproductive activity presents a chain of fertile and sterile functions, and where nature has full sway the chain starts with a fertile function and practically consists of fertile ones only. But in our present-day civilization the sterile functions far outnumber the fertile ones, if indeed, they do not become the rule. Probably modern civilization is to blame for this unnatural condition since it prevents the uterus, intended for strong organic activity, from functioning at the proper time, if not altogether, thus furnishing one cause of myoma and functional endometritis, or metropathy.

The trouble is that we are trying to force into a few decades a constitutional change which ought to be gradual, occupying perhaps thousands upon thousands of years. Of course, social economic conditions are such as to make this abrupt change from housework to long hours of tense occupational work imperative. Yet it is this unmitigated change that brings on many new functional disturbances with their indistinct and confusing symptoms; in other words, female disorders difficult to classify, to diagnose, and to cure.

Now when the anatomic findings prove insufficient to interpret the resulting conditions accurately, the various terms endometritis, metritis, metroendometritis, ought to be replaced, as has been suggested, by the simple colorless term "metropathy," which I shall now use exclusively to denote such functional disturbances. This term, moreover, is quite in harmony with our present state of knowledge, as the results from our therapy merely confirm that we are groping in the dark. For in one case local treatment helps; in another it is useless. Once we accomplish good results by means of general treatment, next time we experience complete failure. The same holds good for a combination of local with general treatment. Moreover, the endeavor to locate the disorder in the region of the inner secretions by methods, no matter how subtle, is at present nothing but an attempt, very promising indeed, yet lacking in positive results.

Briefly this form of so-called endometritis, or metropathy, presents great uncertainty as to etiology, clinical findings, treatment, terminology, and results. Yet we are dealing with a widespread, a serious disease, which not merely interferes with the pleasure of life, but which, in many cases, reduces bodily efficiency and will in time ruin the nervous system. It will suffice to recall merely the excessive and all too frequent loss of blood, a loss of valuable organic products which takes a long time to recover. Where all other means fail, it is now and then necessary, solely to preserve the functioning of the organism, to remove the excessively bleeding uterus completely. This may be advisable, simply because of its abnormal functioning, even in cases where no definite pathologic changes are in evidence.

In the course of time I have formed an opinion somewhat at variance with the usual unstable conception regarding the baffling form of chronic endometritis, or metroendometritis, or preferably metropathy. In developing this, let me refer again to woman's occupational work and its consequences. For is it not an observation common among the medical profession, that most women who take up vocations peculiarly suited to the male sex, are affected, sooner or later, with metropathy? You ask: Why? Well, no other reason can be assigned except the essential difference between man's and woman's sphere of activity as conditioned by their respective constitutions. The woman, so easily fatigued, should be spared all additional exertion during menstruation with its inevitable internal strain, for she is ill-suited, as experience has proved, to stand the uninterrupted even tension of vocational work. When a woman is subjected to such strain, dysfunctions are liable to arise, causing metropathy. This vocational factor seems, in my opinion, to be, despite its vagueness, far more harmful than local neglect during menstruation. To be sure, such common neglect may also contribute its share toward metropathy by causing abnormal decomposition of menstrual blood. The fact that working women cannot, for obvious reasons, carry out their natural reproductive functions, and thus have to impose great restraint upon the sexual organs, is one of the worst features of this walk in life. Thus the disorder, often presenting a combination of local irritation with general functional disturbances, may develop more quickly and distinctly. The experience that in the absence of other factors, a vocation not at all suited to woman's nature induces metropathy, enables us to arrive at the real cause of this common disease. We have now called attention to the two factors which in themselves may be held accountable for the abnormal and excessive bleeding and leucorrhea of the uterus, or if you wish, the two factors which cause a predisposition towards such abnormal functioning, called metropathy. These factors are: (1) In general, maladaptation occasioned by civilization, and in particular the rigors of occupational vocations little suited to women. (2) The subsequent suppression of the natural reproductive

activities. Subsequently there is a functional deviation, as seen in both bleeding and leucorrhea of the uterus, and in addition, great discomfort and pain. That these two factors mentioned are, in truth, the cause of metropathy may be deduced from the especial prevalence of this condition among the laboring classes.

To reach an intelligible etiology of metropathy, a thing to which we have hitherto paid little attention, we need go but one step farther and that is to consider the violence done to woman's sexual function in her normal social life. When you recall the fact that the uterus is seldom allowed to bear its full quota, and that in many cases it is not allowed to bear fruit at all, it is certainly not necessary to ask: What girl, or what woman lives a normal sexual life today? Just consider the female genital function in unrestrained natural life. Compare this function in its purely natural state with its status in the case of an old maid or of the married woman with one or two children, or none at all, as is considered quite normal today. You will admit that our view in this matter must certainly undergo a great change, and that our therapy in this field ought likewise to be revolutionized. The latter is unfortunately impossible because of our economic conditions and the nature of social progress.

To be more explicit: There are on the one hand various factors in our environment that inordinately stir the sexual passions; there are, on the other hand, social and economic factors that will not admit of satisfying what might even be called the normal sexual desires. Among the former we may mention great tension of sex irritation, unavoidable in certain conditions of life, as for instance in courtship, and which cannot at once be released. It is only necessary in this connection to consider that even marriages that take place in what we call early youth are really several years after puberty. Again how many human beings experience none but abnormal irritations in their sexual life! These may be aroused and stimulated by obscene books and talks, by thrilling scenes in theaters, cabarets and movies, even in the streets. Furthermore, unsatisfied cohabitation, onanism, excessive sexual intercourse, all the possible methods of preventing conception in this day and age, cause nothing but sexual irritation. Any of these may bring on metropathy.

Concerning coitus interruptus as cause of this disorder, Hugo Salus has in particular expressed himself in no uncertain manner. He could see pathologic changes appear with this abuse, and disappear with the restoration of normal conditions.

To explain these harmful effects, we must analyze the process of cohabitation. This consists of several acts: First, erotic preparation and erotic moistening of the vestibular glands; second the subsequent erection and ejaculation of the semen. The last named corresponds to the female orgasm. For normal progress of the sexual process, syn-

chronous action on the part of both orgasms is a necessary basic condition. In case no female orgasm occurs, or if in any way the synchronous action mentioned is interfered with, then the necessary exudation in connection with the physiologic blood and lymph inundation of the genital organs does not ensue. The result is chronic sexual hyperemia and hyperlymphia of the organs of the small pelvis and subsequent transudation and proliferative processes. In place of well-mated activity, the asynchronous orgasm develops sexual disharmony and ill-mated activity on the part of the female.

Another source of danger lies in the daily vaginal douche, supposedly a measure to ensure particular cleanliness. However, this practice will eventually harm the organ which ought not to be touched in this way. Summing up we readily see that there are enough local irritants all through the organism, and that in the end they must evoke a local reaction of the sexual organs. Evidently even very general factors, such as a mere temporary change in occupation, residence, habits of life, etc., influence menstruation. Psychic alterations also react on the bleeding, and as is well known, mere thinking of the sexual organs or their activity can produce abnormal secretions of the uterus. Hence the unnatural sexual life of our women presents an infinite number of conditions conducive to abnormal functioning and bleeding, and productive of uterine secretions and pain. That more women are not suffering with metropathy is due solely to their powers of resistance.

From the point of view of the above discussion, I must say that the term "metropathy" though chosen for other reasons, is highly applicable to the functional disturbances it denotes. If one would care to add to this colorless term a descriptive word indicative of the cause, one might say "parachrestic" (Hugo Sellheim), that is metropathy due to perverted sexual life. For as modern woman cannot permit the uterus and its appendages to carry out their natural functions, their organs suffer markedly from the characteristics of the age, whose worst feature is unnaturalness, that is, pervasion of nature.

To be sure, if the uterus is to be healthy and is to function properly, it requires sane and adequate exercise. In this it resembles the other organs of the body, which all react and become sick if not properly exercised, or if their functions are misused or suppressed. Although nature possesses a store of patience, although, as is well known, the normal endometrium will withstand a long series of abuse, yet all the organs will react to violence and will exhibit functional disturbances, which sooner or later always find expression in local pathologic-anatomic changes. Now when the uterus is prevented from functioning, when it is not allowed to bear fruit, it cannot attain the climax of its functional activity. It remains undeveloped and stunted for life, while the woman herself, when forced into sterility, is deprived

of the full enjoyment of life, and of her bodily and spiritual endowments.

Moreover, when the female orgasm is absent for months and years, we have a source of various well-defined pathologic-anatomic changes. Symptoms arising from the pelvic organs develop, likewise many forms of pruritus vulvae and vaginitis, also chronic induration of the uterus and so-called parametritis posterior, hyperplastic endometritis, retention cysts in the cervical glands, varicosity of the broad ligaments, and many disorders due to reflex action. To this lack of exercise on the part of the uterus may be attributed, in addition, many cases of sterility and dysmenorrhea, also the formation of retention cysts in the ovaries, including small cystic degeneration, and follicular and corpus luteum cyst formation. This lack of exercise brings on, above all, the formation of myoma, which is most closely connected with a chronic sexual irritant (hyperemia and hyperlymphia). Moreover, every woman troubled with myoma suffers from a greatly disturbed sexual life in the sense of being ill-mated or of practicing excessive masturbation, while a well-mated woman is never afflicted with myoma of the uterus. In addition, chronic sexual hyperemia, by irritating the sympathetic nervous system, leads to a whole trail of nervous, more especially, vasomotor symptoms. Many cases of sympathetic neurosis, neurosis of the stomach, of the intestines, and of the heart, also many cases of sexual neurasthenia and hysteria are to be explained in this manner.

Mrs. K. W., age twenty-nine, of high social standing, excellent education and culture. Her father was a lawyer and died at the age of forty-eight from an automobile accident. Mother living and well. One brother married and has two children, another brother has been married recently and has no children. Patient has had the common diseases of childhood but no operations or accidents. Her habits are good and she is fond of outdoor exercise. She is the secretary of a wealthy manufacturer and has great responsibilities in carrying out her duties. Her working hours are seven a day, but at the end of the month they are usually ten to twelve hours daily. Her husband is a civil engineer but his position is not a very lucrative one. They both have to work in order to make ends meet and keep up their social position. She is in constant fear of losing her position, if she should get pregnant. Their income would then be greatly curtailed. Her menstruation was normal and regular before marriage, of the twenty-eight-day type, no dysmenorrhea, leucorrhea or any other abnormality. Married at the age of twenty-three, they always employed contraceptives in the form of coitus interruptus. She also uses a douche after each coitus, and is in constant fear during each coitus that she might become pregnant. At present her bleeding is atypical, of the hypermenorrheic type for the last two years, accompanied by pain before and after menstruation; leucorrhea is present and there is intramenstrual spotting. She was never pregnant as far as she knows. Her uropoietic system is normal with the exception of frequency the last six months. Dyspareunia is experienced lately. Her bowels are constipated of late, and she is very nervous. The physical examination reveals a chronic endocervicitis and a nonspecific vaginitis. Uterus and adnexa very sensitive

to the touch but otherwise normal. She is sick in body and soul. It was pointed out to her the perverted sexual life she was leading and pregnancy was advised. Fifteen months later she was delivered of a healthy child and all the symptoms subsided.

That all this is really so, is proved by the fact that when painful coitus, or dyspareunia, is replaced by normal coitus, or eupareunia, all these manifestations and disturbances disappear almost instantly. My case, quoted above in similar connection, is a good illustration of this. Moreover, incredible though it may seem, even retention cysts will vanish completely when a woman becomes well mated. The explanation is quite reasonable when one considers that such cysts have arisen by transudation in conjunction with excessive blood and lymph supply.

To be sure the uterus may not at once present tangible changes, such as hyperplasia of the mucosa, thickening of the walls, myoma, etc., yet the abnormal functioning of its circulatory and glandular apparatus is evident. The cervix, moreover, reacts in its own way to any violence it is made to suffer. It does so by bleeding, by chronic endocervicitis, and by leucorrhea.

Although there are also certain weak congenital constitutions subject to metropathy, due rather to exhaustion than to any misuse, we may say that nearly all cases of metropathy have their origin in a misuse of the female reproductive organs and that there are very few cases demanding a different etiology.

To summarize our discussion, let us again refer to our distinction between endometritis proper and metropathy. We may distinguish two kinds of abnormalities.

1. The one class, whose causes are clearly definite organic irritations which produce a structural and functional pathology. This is true endometritis.

2. The other group, metropathy, with functional and subsequent structural pathology, which originates for the most part in the perverted sexual life of woman, with its consequent abuse and misuse of the uterus, and the genital functions in general.

In this second type the entire organism and psyche in their social setting produce a functional disturbance of the organs of reproduction. When these organs, intended to spend their vitality in a proper manner, i.e., in their reproductive functions, are subjected to violence through abuse and improper function, they react with abnormal bleeding, discharge and pain.

Except in their initial stages, it is impossible to distinguish clearly between metroendometritis and metropathy, for they are in reality but two aspects of the same disease. In the former the starting point is found in local anatomic changes, which in the end, produce functional disturbances. In the latter, metropathy, the disease begins

with functional disturbances, which, sooner or later, produce definite local anatomic changes causing injury to the organs. It is no wonder that the prevailing confusion has arisen, for at one extreme we find structural disturbances in the mucosa and in the musculature with or without attendant functional disturbances, while at the other extreme we come upon functional disturbances without apparent structural injury. Yet each extreme tends to progress toward the other, in between lie all the possible transitional stages, our only distinction being the etiologic factor.

Yet this etiology is extremely important, and we may well ask: "Which has first undergone changes, form or function?" For this problem is of great therapeutic significance. If the disease begins with local anatomic changes, we can determine whether these factors are removable, and a cure may be effected. If, on the other hand, the cause is a misuse of function, the treatment must include an attempt to readjust the patient's sexual life and to restore the natural functions. In the second case the point of attack in an effective therapy would thus shift completely. When, as often happens, functional change antedates structural change, the physician ought to reconstruct the course of the disease's development and progress if he would gain the proper insight and apply a rational therapy at the earliest moment.

In metroendometritis, which begins with local structural phenomena, the diagnosis must be based upon bacterial and histologic examination, and local treatment is called for. This must, of course, be applied before the functional disturbances have gained foothold, and before general constitutional symptoms have developed. In metropathy, on the other hand, the diagnosis and treatment must proceed from the general functional disturbances which, per se, involve social factors.

The physician would realize the justice of the treatment suggested, if the motley array of ever-changing pictures presented itself to him in the proper order, revealing clearly the etiology with reference both to the anatomic and the functional disturbances. Heretofore, the difficulty lay in the circumstance that we were not well acquainted with the functional pathology nor with the idea of seeking the cause in the disturbed function itself when it did not result in any structural change of the organ. But once we grasp this, every difficulty will vanish, it will be an easy matter to consider the mere functional disturbances of the uterus expressing themselves in leucorrhea and irregular bleeding.

In view of our discussion, we must to a great extent remain pessimistic as to a satisfactory solution of the problem. Its general background is the inevitable disharmony between the individual as a static biologic being, and society, constantly changing and progressing. It does not help us in our particular problem to assert dogmat-

ically that women should marry early and bear as many children as they possibly can, for that is a primitive social life to which civilization will never revert.

But certain factors in the social aspect of the problem are capable of some change and consequent amelioration. It is of great importance to society that women should produce normal children, and therefore our problem is even one of public welfare. So far as the physician is concerned, it is his duty in treating metropathy to explain the nature of her sexual maladjustment clearly to the patient, so that she herself under his advice may attempt a normal readjustment; but part of the problem belongs to the sociologist, who can derive much data from the investigations of the physicians. This is obviously proved by the fact that metropathy is to a great extent the product of our industrial order, as is evidenced by the great extent of the disease among women workers.

The physician must be aware of the social factors implied in the etiology of metropathy, if he would solve satisfactorily those cases which come to his attention. But the social theorist, too, will find it of great value in his studies to secure the data of the physician. Perhaps, then, between the two, a satisfactory study can be completed and a fairly adequate compromise effected.

300 Rowena St.

ROENTGEN RAY TREATMENT OF BENIGN GYNECOLOGIC DISEASES*

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WHEN approximately sixteen years ago we began in our clinic to treat hemorrhages of benign gynecologic diseases with x-rays, it was our aim to bring about a permanent amenorrhea by annihilation of all ovarian function. This, at first, could be accomplished only in very few cases and then only after long continued treatment. Repeated radiations at intervals of several weeks were required. Thick abdominal walls, extreme youth of patients, or other unfavorable conditions at times forced us to resort to radical operation after failure with radiation. However, as apparatus, especially the tubes, and our technic improved and experience increased, we soon learned to overcome all obstacles. Thus, we finally succeeded not only in procuring the desired amenorrhea in every case including younger women, but even with a considerable shortening of the duration of the x-ray application. Even this did not seem entirely satisfactory and we then aimed to suppress menstruation only temporarily, or

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merely to reduce the monthly blood loss without actually stopping it. This task was solved as soon as we had discovered means of measuring the x-rays and of determining exactly the required dosage.

While occupied with this work we discovered that very small doses do not weaken or destroy the function of the ovaries but indeed actually stimulate these organs. We succeeded in restoring menstruation in cases of amenorrhea and then occasionally observed a pregnancy in patients in whom sterility seemingly was due to ovarian hypofunction. In a clinical sense we thus were justified in concluding that in these cases the reestablishment of a normal ovarian activity must be the result of an x-ray stimulation. Thus encouraged, we treated systematically young amenorrhoic women in larger numbers and by careful observations ascertained that ovarian stimulation by means of the x-ray not only causes menstruation to become more regular and more normal in amount but that in many instances it would lead to pregnancy ending in full-term labors. There remained the difficult question whether children born by radiated mothers might not exhibit some untowards effects, since all physiologists agree that the x-rays represent a very potent poison to germ plasm, even stronger than alcohol or syphilis, with whose harmfulness on the progeny we are thoroughly familiar.

A series of animal experiments, made by various investigators, led to the following conclusions: There is a great likelihood of premature interruption of pregnancy. The young do not exhibit evident defects, but they show retardation in development in comparison with other animals of the same age. They are weakly and less resistant. In the second generation, the young of these animals are strikingly small and sterile, also deformities are observed. Obviously the results of these experiments on animals cannot be directly applied to the human, and yet there is this one noteworthy fact: Deformities seemingly are not seen in the direct offspring of the radiated mother animals but only in the second generation. Thus, the final decision whether a similar damaging effect, evident only in the second generation, might occur also in the human, will have to be delayed for many years to come. Extensive experience with the effect of x-rays on women so far has shown the following facts: There is evident the same tendency to abortion as is found in animals, the frequency of abortion being from two to three times that of nonradiated mothers. The children often exhibit retardation in bodily development, a high death rate in the earlier months of life, and a high morbidity. This striking similarity with the results of animal experimentation must make us apprehensive of a possibly more deleterious effect that might manifest itself only in the next generation. There can then be no doubt that we had better exclude from radiation all those women for whom the possibility of subsequent pregnancy exists, which prac-

tically means, the exclusion of all women not yet near to or in the climacterium. If x-rays are applied to younger women it, therefore, must be done in a way which precludes any possibility of the rays directly striking the ovaries. Only in this manner can any possible injury to progeny be definitely eliminated.

The first step in this direction was the radiation of the spleen. As early as 1923, I reported my observations on spleen radiations in 80 cases, and since that time this form of radiation has become a permanent addition to our gynecologic therapy. The effect of spleen radiation on hemorrhages was accidently discovered by R. Stephan in 1920, when he tried it in two cases of fulminant purpura and was surprised by the striking effect. Stephan found that radiation increases the coagulability of the blood and ascribed the phenomenon to an irritating effect of the rays on the reticuloendothelial apparatus. However, this explanation cannot be maintained any longer. It is rather generally assumed at present that blood coagulability is enhanced by the liberation of larger amounts of coagulation-promoting ferments through the destruction of blood cells and especially lymphocytes, which, of course, is best achieved in the spleen which contains them in large amounts. We are dealing with a kind of protoplasma activation.

Changes in the blood produced by spleen radiation manifest themselves within a very few hours. They persist for two or three days and then slowly disappear. For this reason spleen radiation is principally employed for prompt stopping of hemorrhages without expectation of a permanent curative effect.

The technic of this type of radiation is very simple. Above the area of the spleen, established by percussion, a field is drawn, 15 cm. long and 10 cm. wide. Radiation is carried out with the patient lying on her right side, with same apparatus, tube, and filter as used generally for intensive radiation. Focal distance from skin is 40 cm., the dosage measured on the skin is one-third of the erythema dose.

The cases thus treated by us comprised all kinds of hemorrhages in benign affections: puberty hemorrhages in young girls; hemorrhages with adnexal masses; miscarriages; climacteric metrorrhagias; hemorrhages from fibromatous uteri or presumably due to endocrine disturbances of the ovaries in the absence of definite pathologic findings.

In most of these cases various forms of treatment, and different medicines had been previously tried without success. In 70 per cent of the cases a favorable effect followed a single spleen radiation, that is, the hemorrhages ceased entirely or almost so. In those instances in which the hemorrhages could not be influenced, radiation was repeated after a few days, but results of repeated radiations were not satisfactory.

Since not only momentary but permanent successes had been reported by some authors in the sense that, for instance, excessive menstrual flows were lessened for a long time or permanently, or when menses came too frequently, the intervals were lengthened, we studied our material from this viewpoint. We found that one can hardly speak of permanent results of spleen radiation in this sense. Of course, it often happens that later inquiry reveals that the type of menstruation had become normal, but the more acceptable explanation of this occurrence is, that spleen radiation had removed a temporary disturbance and that normal conditions in the meantime had established themselves.

We also made some experiments with spleen radiation in obstetric work. Stephan had recommended this procedure for hemophilic patients, preceding operation. The results were extremely satisfactory. In a similar manner, we thought that in cases of placenta previa a spleen radiation might reduce the anticipated severe blood loss of labor. These experiments, however, proved unsuccessful, as might have been expected. In these cases the severe hemorrhages are actually caused by the opening up of many and large blood vessels, a disadvantage not entirely to be counteracted even by increased coagulability of the blood. The control of hemorrhage under these conditions is dependent more on compression of the vessels by the contracting musculature than upon the prompt formation of thrombi. More noteworthy are the successes in cases of melena neonatorum. We have a long series of such cases with severe melena and vomiting of blood, where a single radiation of the spleen for only five minutes caused, without any other therapy, the immediate cessation of all hemorrhage with recovery of the infants. For this type of case spleen radiation surely will find its permanent place in therapeutic efforts.

The prompt effect of spleen radiation renders the procedure particularly valuable in metrorrhagias from fibroma or incident to the climacterium. Intensive local radiation in these patients is often followed, once or twice, by hemorrhages severer than before. Especially in cases in which hemorrhages have occurred for some time and the patients have become critically anemic, this chance of further increase of blood loss might induce some physicians to give preference to operation over radiation. It, therefore, is our rule to instruct patients after intense local irradiation, to return to the clinic if the next flow is profuse, and if we feel that we can prevent further blood loss by one additional radiation of the spleen.

In cases in which spleen radiation proves a failure, x-rays might be applied to the liver, as first recommended by Borak. The procedure is carried out in the same manner. We have repeatedly succeeded with radiation of the liver after failure with the spleen. Also

in this type of application the effect is ascribed to the large amount of blood present in this organ.

With intensive radiation of the ovaries not only the external secretion of the organs, i.e., the ovulation process, is stopped, but also far-reaching effects are obtained on their internal secretion, as indicated in the appearance of the typical menopause symptoms. It might be mentioned in this connection that an attempt has been made to explain the results of radiation of the spleen or the liver on the basis of some effect on the endocrine function of these two organs which somehow stands in correlation to ovarian inner secretory activity. But as stated before, there is, at present, no doubt that all effect is limited to the influence of the rays on the blood itself and the sources of its origin, respectively. During further attempts to replace ovarian radiation by application of the rays to other organs, it was found that a definite influence upon endocrine ovarian activity can be obtained by such irradiation, though never reaching the ovaries themselves. Search along these lines was based on the knowledge that there exists an interrelation between all endocrines in general, and between the hypophysis and ovaries in particular. This information had been gained in experiments which showed that removal of the hypophysis in young animals retards the development of their genital organs and furthermore causes marked changes in physiologic processes, ending in peculiar pathologic symptom complexes.

In this connection we may well remember the changes in the hypophysis noted during pregnancy and the puerperium, as well as disturbances in the genital functions commonly observed in connection with disturbed hypophyseal activity and especially in cases of acromegaly. Hofbauer was the first to recommend radiation of the hypophysis in the treatment of gynecologic diseases (1922), and he reported good results in uterine hemorrhages from myoma or in the climacterium. Thus was pointed out a new way of influencing ovarian function by rays. It was furthermore ascertained that this procedure was not harmful to the patient, which is not surprising in view of the known fact that brain tissue is strikingly insensitive to x-rays.

In our clinic we administered small doses to the hypophysis in cases due to hypo- or dysfunction of the ovaries. A field is outlined, 2 cm. by 2 cm., about at the center, between the outer circumference of the orbit and the anterior boundary of the external auditory meatus, and this area on either side of the head is given one-third of the skin erythema dose. In the largest number of cases we could not discover the slightest injurious effect on the patient. There are no unpleasant symptoms connected with this procedure. Some few nervous women might complain of slight headache which, however, always disappears promptly. Nausea or vomiting was hardly ever encountered. If these applications are repeated at short intervals

hair might be observed to fall out, but it soon begins to grow again in this area. We began to treat some cases of dysmenorrhea and amenorrhea and met with some surprising results. Pain, severe enough to defy all types of treatment, including surgical, and requiring the administration of morphia, disappeared completely after radiation. But, to be sure, the result was not always permanent. After six or eight months, often sooner, the trouble recurred, but another radiation of the hypophysis without exception again brought the desired relief. The same prompt effect could be seen in the amenorrhoic patients. Often only a few days after the treatment a uterine hemorrhage appeared, which recurred at regular intervals. Radiation usually proved a failure only in women near forty, or in whom the amenorrhea had persisted over three years, or in whom marked changes of the uterus could be discovered. In women in whom menstruation occurred at short intervals or was too free, radiation often led to decided improvement. Later we began to treat marked climacteric symptoms, following natural or operative menopause, or ovarian radiation, with the administration of x-rays to the hypophysis, and obtained surprising results—often in cases that had been refractory to every kind of treatment, causing the sufferers to become despondent. However, no effect could be seen in actual postclimacteric psychoses.

In time we extended this treatment to gynecologic conditions, not obviously due to endocrine disturbances, such as leucorrhea, pruritus vulvae, etc., and again we often saw improvement and even permanent cures.

Also in obstetrics, radiation of the hypophysis finds its useful field. Some have claimed a relation of certain types of pregnancy toxicosis, especially of hyperemesis and hypersalivation, to disturbed inner secretory function, and a similar etiologic relation has also been suggested for pruritus and other dermatoses. Application of x-rays to the hypophyseal region has led to improvement or cure in many cases of this type. It is probably only the rapid and tempestuous course of eclampsia which so far has excluded these patients from more extensive study of the effect of this form of radiation on them. But I have but little doubt that the procedure some day might be found very beneficial at least in the prevention of such an exaggerated state of toxicosis.

Though very effective in most cases of dysmenorrhea, amenorrhea, or climacteric molimina (for the latter Borak claimed 100 per cent success), radiation of the hypophysis, like any other potent therapeutic measure, will be found to leave certain particularly refractory patients unaffected. In some of these instances it has been found that the desired result can still be obtained by applying the same dose of x-rays to the thyroid. This seems plausible, because in these various

anomalies a disturbed ovarian function is not always, necessarily, the causative factor. The result of the treatment seems to be dependent upon the application of the x-rays to the organ actually responsible for the disturbance. It might be possible in the future to ascertain with greater certainty the one responsible gland or organ, thus enabling us to select the region most appropriate for application of the rays.

As a matter of fact the cases in which radiation of the hypophysis fails while that of the thyroid succeeds, seem to be those which exhibit some of the characteristic signs of hyperthyroidism (decrease in weight, nervousness, rapid pulse, tremor, tendency to perspiration, etc.). It seems certain that further studies and observations will enable us at a future date to select more correctly the gland which should be exposed to the rays, and it might be a gland heretofore not considered in connection with this therapy.

Naturally, we employ x-rays in our clinic for other benign genital diseases as well, and send the rays directly against the vulva in cases of pruritus, kraurosis, or condylomata acuminata, but these procedures lie outside of the scope of this paper, in which I endeavored to show how, during the past few years, our ideas concerning the usefulness and technic of x-ray application in benign gynecologic diseases have gradually changed, and in which directions further progress with this therapy might be expected in the near future.

UTERUS DUPLEX BICOLLIS, VAGINA SIMPLEX, AND SUPERFETATION

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THE urogenital system, although the youngest philogenetically, is probably the most complicated of the whole human organism. Since these two factors, philogenetic youth and intricacy of structure, inherently cause vulnerability, it is not surprising that malformations of the uterus are rather frequent. While today we can logically classify the various anomalies of uterine formation, we are still in the dark regarding their actual genesis. We know from our study of embryology that a double uterus is caused by a lack of fusion of the genital ducts but can advance no convincing reason why the müllerian tissue does not unite in a given case. The explanations offered by different investigators vary widely and a brief review of the literature will be of interest in showing the more important theories on this subject. In his monograph von Winkel[1] gives various reasons for uterine anomalies and cites disturbances of development

of the intestinal tract, bladder, or a cystic allantois. He also mentions Graetzer's theory, who believed that fetal peritonitis was responsible for uterine malformations. The latter cause, however, can certainly be accepted for only a very few cases. Krieger,[2] Kussmaul,[3] and a little later Fuerst,[4] credited the rectovesical ligament with the production of double uteri, because this ligament is sometimes found between the two horns of a single uterus or between a double uterus. Undoubtedly, however, this ligamental anomaly is not the cause but only a concomitant further structural change as Kermauner[5] has pointed out. The latter makes an abnormal persistence of the cloaca responsible for the separation of the genital ducts. Felix[6] and also Rosenstein[7] have a somewhat similar theory and state that formative disturbances of the intestinal tract and developmental errors of the ventral abdominal wall are the deciding factors in these cases. This view is perhaps correct in some instances inasmuch as von Franqué[8] has reported four cases which apparently substantiate this conception. Differing from the previously mentioned investigators, Pick[9] held that interference by stray cells of müllerian tissue or a tumor "anlage" may keep the ducts apart. The absence of tumors in most cases of double uterus, however, speaks against such an assumption. Pfannenstiel[10] was of the opinion that a primary broader anlage of the lower part of the trunk might cause failure of union of the müllerian ducts and R. Meyer[11] believes that double uteri may be the result of an originally too great separation of the ilioinguinodiaphragmatic ligaments, or that too short round ligaments might cause a torsion and separation of the müllerian structures.

An abnormal separation of the ligamentary apparatus in itself, however, does not always cause double formations of the uterus, as I myself have operated upon a case for fibromyomata uteri and ovarian cyst in which both round ligaments were inserted three-quarters of an inch away from the uterine cornua into the tubes. Except for their insertion the ligaments were normal in appearance and length. One might of course say that I was dealing here with a bicornate uterus and that the apparent tubal portions between the uterus and the round ligaments were really uterus. At the same time the uterus, except for the fibromyomata, was normal in every way as were likewise the tubes, and histologic examination showed typical tubal structure in the portion of the fallopian tubes between the uterus and the round ligaments. The fibromyomata themselves of course could not have caused the abnormality of the round ligament insertion.

Probably the theory originated by Thiersch[12] that a marked development and longer persistence and greater separation of the wolffian bodies may cause double formations in the female genital tract, is as plausible as any; Frankl[13] in his studies on the round ligament also has shown that the shortness and thickness and wider separation of

the round ligaments so common in cases of double uterus (cases of Frank,[14] Holzbach,[15] Meyer,[11] Pfannenstiel,[10] etc.) are not the result of the double formation but a deciding factor in its development. Of course a longer persistence of the wolffian body will cause a short round ligament and such a ligament may indeed prevent a union of the müllerian ducts. At the same time this is really carrying the process back but one step and we still do not know why the wolffian bodies should show the changes described. Judging from the numerous cases of double uterus reported and the described findings in each it seems probable that varying factors are at work and that there is no one uniform etiology for all cases of double uterus. Perhaps, too, von Winkel[1] is correct in assuming that besides purely mechanical factors there are also inherent attributes of the germ plasma itself to be reckoned with.

The following case, while it presents nothing new, appears to me to be of sufficient interest to be reported in the literature because of the superfetation which occurred in the physiologically adequate double uterus.

CASE 1.—A. M., Italian woman, thirty years old, who had been married three years and had no previous operations. Menstruation began at seventeen years and was always normal. She had one child two years ago, which is living and well. Her second pregnancy is described below.

The patient was first seen in July, 1925, complaining of vaginal discharge and backache since her last confinement two months before. At that time she gave birth to a seven months' child (now living and well) and three days later again having labor pains, passed something which an experienced midwife informs me was a three months old fresh fetus in its membranes. After this the patient made an uneventful recovery.

Physical examination showed a well-nourished woman with normal palpatory abdominal findings, normal external genitals, normal single vagina, but two cervices, both rather short and somewhat eroded and both showing a moderate transverse laceration. The cervices were situated side by side and united only in the midline by a sagitally disposed fibrous band about 2 to 3 mm. broad. Two uteri were felt, one to the right and the other to the left of the median line, diverging from each other at an angle of about 45 degrees. The left uterus, measured with a sound, was 9 cm. long and the right one 7¾ cm.

The patient was treated a few times, after which she stayed away and was not seen again until the beginning of 1926. The erosions of the cervices were less marked now than six months before and the discharge and backache improved. The left uterus now measured 8 cm. in length and the right one 7 cm.

Because nephritic malformations often accompany uterine anomalies, a cystoscopy was done but showed only a perfectly normal bladder with two normal ureteral openings. An x-ray was refused by the patient.

Aside from the double uterus in this case we have the history of a previous normal single pregnancy, and now of a double pregnancy with the fetus of widely different ages. Since both of the uteri were of normal size and both showed a laceration of the cervix, we must consider them both as physiologically adequate.

The question remaining then is that of the superfetation. We can almost certainly assume that superfetation actually took place in this patient as the second fetus was fresh and not compressed or mummified as it would have been had both pregnancies begun simultaneously in the same uterus and one of the fetuses been overwhelmed by the development of the other. This of course disregards the practically negligible possibility of the two pregnancies beginning synchronously in each of the two uteri as there would be no assignable reason for the difference of development of the two products of conception. The point to decide is whether the superfetation occurred in the same uterus or not.

Superfetation, perhaps because of its rarity and also possibly for its legal aspects, has often occupied the minds of obstetricians and has been held possible even with single uteri and uterine pregnancies. In such cases, however, the second impregnation must be accepted as taking place before the first ovum occupies the uterine cavity, or has filled it to any appreciable extent. Both fetuses therefore must approximate one another in age. This being true, a diagnosis of superfetation is very difficult because developmental peculiarities, for instance, diminished blood supply to one fetus, may be responsible for a difference of growth of any two fetuses, even though they in reality date from the same impregnation. I believe that many of the cases of so-called superfetation in a single uterus with two uterine pregnancies of apparently widely different ages are errors of interpretation and that true superfetation, because of the fact that the two fetuses must closely approach one another in age, may go unrecognized. At the same time it must not be forgotten that superfetation even in the early stages of pregnancy must be rare because usually the corpus luteum formed at pregnancy will inhibit the development of other ovarian follicles. As a result, superfetation can theoretically occur only at a time when the action of the corpus luteum has waned, that is, around the fourth to fifth month. This supposition agrees well with my case but must necessarily render superfetation in a single uterus practically impossible. True superfetation may, however, occur in cases of a primary ectopic gestation with secondary uterine gestation, or in double uteri, and such cases have been reported in the literature (Buyaski,[16] Cassan,[17] Trapet[18] and others). Even then, however, superfetation must remain rare because of the unusual nature of the conditions prerequisite for its occurrence.

In view of the just mentioned considerations, the history and the physical findings of my case, both two and eight months after confinement, I think we can safely say that we are dealing with a true case of superfetation in a double uterus. Judging by the size of the two uteri it also seems probable that the superfetation occurred in the right uterus.

Clinically there is little to be said of such cases. As might be expected dystocia is common, also premature labor, especially as regards the second product of gestation. The question as to whether in a case of double uterus with a pregnancy in one side, the other uterus would menstruate, must be answered generally with no. In ectopic gestation menstruation practically always ceases, as the decidua forms even though the uterus is empty, and the same will apply to the empty horn or side of a singly pregnant double uterus.

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VICARIOUS (SUPPLEMENTARY) MENSTRUATION, WITH THE REPORT OF A CASE

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NORMAL menstruation is a phenomenon, the exact cause of which has never been satisfactorily explained or thoroughly understood. Even more perplexing are those instances in which there is extrauterine bleeding coincident with the menstrual flow, or complete substitution in some other organ of this natural uterine function.

The most unusual type of extrauterine bleeding accompanies the regular monthly period and occurs while the uterus is functioning. Far less common is the case where a true vicarious menstruation takes place, apparently in an effort to compensate for the loss of this uterine function.

Condit's[1] report is a classic example of the latter type. Following supravaginal hysterectomy and bilateral oophorectomy, his patient bled into a nevus of the chest wall. The hemorrhage occurred regularly every twenty-eight to thirty-four days for twenty-one months and was accompanied by the usual premenstrual symptoms and molimina. The nevus finally ruptured and was excised. Following this there was a hemorrhage into the left breast every month, the breast increasing in size and always subsiding between periods. After a year all bleeding stopped for six years when it was again manifest by extensive ecchymoses on both thighs, which recurred at irregular intervals for several months.

The case is of particular interest because both ovaries had been removed and, unless supernumerary tissue was overlooked, it occurred without ovarian influence. It is to be regarded, therefore, as an attempt on the part of the body to compensate for the loss of the uterus.

While vicarious menstruation is generally regarded as a disturbance of, or due to, an increased ovarian function, it is difficult to understand why it does not occur more frequently after hysterectomy without removal of the ovaries. It is generally admitted, however, that removal of the uterus results in ovarian atrophy, but in such cases the process is gradual and the symptoms of menopause are usually absent.

In proof of ovarian influence Rosser's[2] case may be cited. In this instance bleeding occurred regularly from the conjunctiva and the ear, and was stopped only after bilateral oophorectomy.

Other cases are apparently due to deficient ovarian function as

witnessed by the patient of Funk and Ellis[3] in whom there was periodic bleeding from the mouth associated with hypoplasia of the uterus and tubes and aplasia of the ovaries and breasts.

Ocular manifestations of vicarious menstruation are common and the literature on this phase of the subject has been reviewed by Gleason.[4] The cases reported are either those of conjunctival congestion, subconjunctival hemorrhage, retinal hemorrhage, or bleeding into the anterior chamber. A report in which there was an escape of blood from the eye without subconjunctival ecchymosis cannot be found in the literature.

Many cases might be cited from the literature, but in spite of the frequent reports, the occurrence of the condition has been doubted by many careful observers. Surely too many instances of simple epistaxis, pulmonary hemorrhage, and bleeding hemorrhoids have been reported as vicarious menstruation.

Roth[5] in an extensive review of the literature since 1870 found 270 cases of vicarious menstruation. In 30 per cent the bleeding was purely vicarious, and in 70 per cent supplementary. Hemorrhage occurred from the nose in 30 per cent; skin (including fistulae) 10 per cent; lungs 8 per cent; breast, stomach and mouth, each 4 per cent; bladder, eye, ear, kidney, vagina, 0.45 to 3 per cent each.

The case here reported is of interest because of the number of organs affected, the periodicity of its course throughout many years, and its complete and immediate cessation following oophorectomy.

Patient, aged thirty-five, single, referred by Dr. C. W. Strickler, of Atlanta, Ga., entered the Wesley Memorial Hospital December 18, 1925, because of severe abdominal pain following peritonitis. Her father died of pneumonia; her mother is living and well. There was no history of hemophilia or any hereditary disease. She was healthy as an infant and aside from diphtheria, scarlet fever and typhoid was never ill. Menstruation began at the age of twelve and since onset there has rarely been a period when there was not bleeding from some other organ. Uterine flow has, however, been regular, and the supplementary bleeding occurred only at the menstrual periods and never in the interval.

In the early years of her menstrual life there was bleeding from one or both nipples without any swelling or ecchymosis in the breast. On several occasions there was hemorrhage from the gums and cheeks. Often there was severe toothache and bleeding into the root cavities of the upper incisors, necessitating their removal. Some fifteen or twenty pulmonary hemorrhages have occurred, and on this account life insurance has been refused in spite of negative examinations and roentgenograms of the chest. Bleeding from the stomach and bowels has occurred at times. On one occasion there were pin point hemorrhages from the skin.

The most unusual feature was the bleeding from the left eye. The patient stated that this came on without warning and at times there would be as much as a "cupful" of bright red blood. Examination by various ophthalmologists failed to show any bleeding point. Twelve years ago the appendix, right tube and ovary were removed without relief. A year ago a uterine suspension was done and the gall bladder, containing a stone, removed. No improvement followed.

Ten weeks before admission to the hospital, she pricked her finger with a rose thorn and an infection of the hand and arm, requiring multiple incisions, followed. Later symptoms of pelvic peritonitis developed. She was confined to bed and her temperature ranged from 100° to 102° F. During the ten weeks of this illness she lost forty pounds. On admission to the hospital her chief complaint was severe abdominal pain, most marked on the left side.

Examination showed a lower midline and upper right rectus scar on the abdomen. The lower abdomen was tender and the left side spastic. Vaginal examination disclosed a tender mass in the left adnexal region. Blood pressure, 130/85; urine, negative; W. B. C., 10,000; polys., 74 per cent; hg., 60 per cent; temperature, 98° to 99.3° F.

A diagnosis of right tuboovarian abscess was made, but it was thought best to defer operation until this process was less acute and the patient's general condition had improved. For three weeks preceding the operation she was confined to the hospital, during which time she was rarely free of abdominal pain, which occasionally required morphine for relief.

On January 2, 1926, the patient's menstrual period was expected. At this time she had an increase in the abdominal pain, headache, and the usual premenstrual symptoms. During the morning there was a sudden hemorrhage from the left conjunctiva, estimated to be about 30 c.c. This was checked by dropping three minims of adrenalin, 1-10,000, in the eye. No bleeding point and no conjunctival injection could be seen.

The following day menstruation had not begun, but, while I was examining the patient's abdomen, she called my attention to the fact that her eye was beginning to bleed. I thus had a chance to observe this phenomenon from the onset. The blood quickly filled the eye and overflowing the lid ran down the cheek in a steady stream. The conjunctiva was irrigated with saline in an attempt to see a bleeding point, but the hemorrhage was so brisk that this could not be made out. After she had bled about 30 c.c., three drops of adrenalin was instilled and the bleeding immediately stopped. The exact origin of the flow could not be determined. Normal menstruation began during the night of January 3 and continued for five days. There was no further abnormal bleeding.

By January 11 the patient's general condition had greatly improved and it was thought that her condition would warrant operation.

Under gas oxygen anesthesia the abdomen was opened in the lower midline through the old scar. Small intestine and sigmoid were densely adherent to the abdominal scar and in the pelvis, and the adhesions were freed with great difficulty. The uterus was found in good position and normal in size and contour. The right tube and ovary and appendix had been removed. On the left side was a tense tuboovarian abscess, about 6 cm. in diameter, in which ovarian structure could not be made out. This was removed, and the wound closed without further exploration.

Her postoperative convalescence was stormy for the first three days, following which her recovery was normal. She left the hospital on February 4, 1926. At the present time she has gained in weight and strength, is free from pain, and her general condition is excellent. Since operations there has been no bleeding from any organ.

CONCLUSION

The case here presented had suffered for twenty years with bleeding from various organs, including the eye. This bleeding was always coincident with menstruation. The cure of the condition by oophorectomy (performed for tuboovarian abscess) apparently proves that

the extrauterine bleeding was a menstrual phenomenon and the result of ovarian overactivity or dysfunction.

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24 DOCTOR'S BUILDING.

A COMPARISON OF THE CONTENT OF POTASSIUM IN MATERNAL AND PLACENTAL SERUM

BY HARRY BAKWIN, M.D., AND HELEN RIVKIN, M.A., NEW YORK

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THE potassium content of maternal and placental serum, simultaneously collected, was determined by the method of Kramer and Tisdall.[1] This method, though not entirely free from inaccuracies, is more reliable than those methods hitherto used in similar studies. Blood was obtained from the placenta immediately after delivery. Within ten minutes blood was drawn without stasis from the median vein of the mother. The serum was separated within thirty minutes. Both placental and maternal sera were collected under albolene. All the mothers received an anesthetic (either ether or chloroform). Specimens showing the faintest trace of hemolysis were discarded. All the placental sera examined were bile stained.[2]

Edelstein and Yllpö[3] made simultaneous determinations of the potassium content of maternal and placental serum. Their values in 11 cases varied from 28 to 203 mg. of K_2O per 100 c.c. In 4 instances the K_2O was over 100 mg. Such wide fluctuations suggest some technical error, probably hemolysis. They state that the blood specimens were defibrinated by shaking with glass beads. The red cells of the newborn are especially easily fractured. Excluding the 4 high figures their average for the maternal serum was 40 mg. of K_2O per 100 c.c. for placental serum 53 mg. Karnitzski[4] states that the fetal blood is poorer in potassium than adult blood.

In normal adults and children the potassium content of serum is fairly constant, varying by the use of this method between 18 and 22 mg.[1] The values may be slightly increased after the ingestion of potassium salts[2] and in infants with tetany.[5]

The results of the determinations along with other data are shown in Table I. It is at once apparent that the potassium content of placental serum is considerably higher than that of maternal serum. The average for placental serum (38.5 mg. per 100 c.c.) is almost twice that obtained by Kramer and Tisdall for normal children and adults (21 mg. per 100

c.c.). The maternal values show slightly wider variations than those reported by Wilkins and Kramer. The average is 20.7 mg. per 100 c.c.

There is apparently no relation between the potassium content of the serum and the sex, color, or birth weight of the baby or the parity of the mother. That the increased concentration of the placental serum is not due to changes in the serum concentration is shown by the values for protein (Kjeldahl method), calcium (method of Kramer and Tisdall[6]), and chloride (method of Whitehorn[7]).

TABLE I

NUMBER	BIRTH WEIGHT	POTASSIUM MG. PER 100 C.C.		PROTEIN MG. PER 100 C.C.		CALCIUM MG. PER 100 C.C.		CHLORIDE MG. PER 100 C.C.	
	Kg.	Plac.	Mater.	Plac.	Mater.	Plac.	Mater.	Plac.	Mater.
1	3.91	35	23	6.6	7.0	11.1	10.7	370	370
2	3.32	26	23	5.5	7.4	10.4	12.4	387	376
3	—	38	20	5.8	7.4	—	—	370	367
4	3.18	33	21	5.4	5.9	11.2	9.3	397	399
5		45	18	6.2	6.0			361	372
6	3.45	38	18	5.7	5.8	11.3	10.0	386	374
7	3.11	23	17	5.0	6.4	12.0	10.2		
8	3.72	23	22	6.5	6.6	11.2	10.0	370	367
9	3.12	51	19	5.6	6.9	10.0	9.4	364	362
10	3.52	42	20	7.0	7.4			381	374
11	2.96	40	20	5.4	6.3	11.5	9.8	374	368
12	2.50	39	23	6.4	7.9	10.1	12.9	366	362
13	3.29	33	24	4.9	5.2	11.0	10.1	359	366
14	3.23	43	25	6.7	7.3	11.2	9.0	368	372
15		35	21	6.1	6.3				
16		38	20	5.8	6.7			362	353
17		49	24	5.5	5.5			362	365
18	2.98	52	19	6.1	7.5	11.3	10.3	367	359
19		40	18						
20	3.58	46	19	7.9	5.7				
Average		38.5	20.7	6.01	6.59	11.0	10.3	371	369

The protein content of maternal serum was usually higher than that of placental serum. This is the usual finding. The calcium content of placental serum was slightly higher than that of maternal serum. The chlorides showed no constant difference.

SUMMARY

1. The average for the potassium content of placental serum is 38.5 mg. per 100 c.c., almost twice that for normal children and adults.

2. The average for the maternal serum is 20.7 mg. per 100 c.c.

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1022 PARK AVENUE.

SOME OBSERVATIONS ON THE VACCINATION OF PREGNANT WOMEN AND NEWBORN INFANTS*

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THE severe outbreak of hemorrhagic smallpox occurring in Minneapolis during the winter of 1924-1925, made it urgently necessary to protect the public by means of vaccination.

At the prenatal dispensary we were besieged with questions regarding vaccination during pregnancy; many patients said that other physicians advised them against it for fear of obstetric complications.

Again, in the hospital the necessity of vaccinating newborn infants arose, due to the development of a case of smallpox in the obstetric wards.

As a result, all patients at the prenatal dispensary were vaccinated regardless of the period of pregnancy, and all newborn infants were vaccinated as soon as possible after birth. This work was done under the direction and supervision of Dr. Fred L. Adair, Chief of Division "A," Obstetrics and Gynecology, at the General Hospital, Minneapolis, Minn.

Le Lievre,[1] in 1903, in his discussion of the vaccination of pregnant women and newborns asks the following questions: "Should one vaccinate pregnant women?" "Does this hygienic precaution not disturb the course of pregnancy?" Further, "Cannot the child be benefited by the successful vaccination of the mother?"

He states that experimentation as well as clinical observation has demonstrated the possibility of vaccinating a child in utero and as his authority quotes from *The American Journal of Medical Sciences* of June, 1853, where the first case is reported in which successful vaccination of a mother during the prenatal period imparted an immunity to her child. This consideration was based upon the fact that the child in question was vaccinated several times without a successful "take." In conclusion he states that one may affirm the transmission of vaccinal immunity from the mother to the child and that in an epidemic all pregnant women should be vaccinated to preserve themselves and their children from the danger of smallpox.

Pierrot,[2] in his Lyon thesis of 1904 says, "The course of vaccinia in the newborn is often very benign and does not have the local reaction and fever so often seen in other children. For this reason early vaccination of all infants born at term is advised. There is no reason to believe that the immunity conferred by early vaccination is less lasting than that produced by vaccination done two or three months later. The pretended immunity of the newborn should not be taken into account."

Beauquey[3] comments upon the very mild character of the vaccinal reaction in the newborn. He urges early vaccination because at a later date there may be an eczema present, which he considers a contraindication, or the child may be teething, lowering its resistance and making the reaction more severe.

Cathala[4] reviews the statistics of the vaccination of infants in the maternity ward of Saint Antoine Hospital, Paris. In 673 vaccinations there were 540 positive reac-

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tions or 80.23 per cent. All of these infants were vaccinated during the first four days of life by the method of scarification which he says gives the best results. He states that failure to obtain a higher percentage of positive reactions is due to faulty technic.

Bonnaire[5] reports the vaccination of 532 infants at the Maternitè, Paris. These infants were vaccinated the third day after birth. There were 59 per cent positive and 41 per cent negative reactions.

Wurtz[6] advises early vaccination of newborns except in cases of congenital debility, infections, hemophilia and dermatitis. He urges revision of the French law so that legal vaccination may be performed on or after the tenth day.

Camus[7] believes that experimentation and statistics have shown that vaccination is often unsuccessful when done under three months and may be attended by harmful results. He emphasizes his belief that children under three months have nothing to fear from smallpox due to their inherent immunity to all infectious diseases.

Mensching[8] reviews the German work on the subject and gives the results obtained in a large series of his own cases. He quotes Ablatz, Palm, Franz and Kuhner,[9] who in 1915 published a paper based upon the vaccination of 300 newborns. These workers unanimously agree that the well-being of the newborn is not altered by vaccination and with the exception of Ablatz urge vaccination in the early days of life. With reference to the vaccination of pregnant women the above authors agree with the opinions held by Friedberg, Burckhardt, Gast, Behm and others that their well-being is not altered.

Mensching[8] vaccinated 684 newborns, the results being 71 per cent positive and 29 per cent negative reactions. He believes his low figure of successful vaccinations is not due to the low susceptibility for the vaccine but due either to faulty technic or to intrauterine transference of immunity.

The reactions obtained developed on the seventh or eighth day with the formation of a typical pustule, severe local reaction, areola formation and marked infiltration of the skin. Swelling of the axillary glands was a constant feature. Six cases showed a generalized exanthem usually occurring on the ninth day and persisting for not more than two days.

He vaccinated 62 premature infants with a minimum weight of 2300 gm. In these he obtained 64 per cent positive and 36 per cent negative reactions. The course of vaccination in these infants differed and in no way from those at full term.

In regard to the transference of immunity in utero, he states that the number of unsuccessful vaccinations was larger in infants whose mothers were vaccinated during pregnancy by 14.1 per cent, while Kuhner reports this difference as 9.8 per cent. In a series of 206 cases there were 62 per cent positive and 38 per cent negative reactions. In these negative cases there was a possibility of intrauterine transmission of immunity as ten were revaccinated without success. He concludes that intrauterine transmission of immunity is possible but rare and uncertain and should not be relied upon in case of an epidemic.

In our own series the results of the vaccination of 129 pregnant women are here reported. These women were seen in the prenatal dispensary and were vaccinated regardless of their periods of pregnancy. Fresh vaccine was used and worked into the skin by scarification. The period of pregnancy was recorded and the patient directed to return on the third, sixth and tenth days following. They were cautioned to report any untoward effects such as abdominal cramps, vaginal bleeding, etc.

Five per cent of the positive cases showed rather severe symptoms of backache, anorexia and malaise with a rise in temperature. There was not a case of threatened abortion, miscarriage or premature labor.

There was not a single instance in which the course of vaccination differed from the moderately severe reaction obtainable in any other individual. In 20 per cent of these women vaccination had been done elsewhere and this data was obtained at the time of delivery.

In our series of vaccinated newborns, all infants were vaccinated, with but few exceptions, on the third day after birth. They were all vaccinated on the left deltoid region after first cleansing the area with ether and allowing it to dry thoroughly. Fresh vaccine was then applied and in those of Series I worked into the skin by a fine sharp needle, making not more than five punctures 1 mm. apart. In Series II the same preparation was carried out and the vaccine worked into the skin by scarification. Four parallel scratches were made about 3 mm. long and 1 mm. apart. The area was left to dry and sterile dressings applied.

Following the inoculation with the virus, the vaccinated area showed no evidence of reaction until about the fifth or sixth day, when babies that reacted positively developed a small papule, differing from the adult type in that the usual red zone was faint or absent. This evolved until on the seventh or eighth day a vesicle formed with a slight red zone. Most babies showed axillary adenopathy at this time.

On the ninth or tenth day we found the vesicle had enlarged to about the size of a dime and became distended by a thin purulent fluid. This pustule was surrounded by a pearly white margin from 1 to 2 mm. wide and had a rolled appearance. There was very little infiltration of the skin around the vaccinated area.

The pustule now started to umbilicate, usually ruptured, dried rapidly and formed a rather adherent scab which separated about the eighteenth to twenty-first day. Babies observed at the end of six weeks after vaccination exhibited a small, superficial scar which was not at all conspicuous.

Babies having negative reactions presented no change in the vaccinated area and after four or five days it was very difficult to see the puncture or scarification marks.

Three babies having negative reactions were revaccinated. They developed typical positive reactions after the second inoculation. We were unable to obtain further accurate figures on the revaccination of babies as the mothers and infants left the hospital from the ninth to eleventh day. We were further handicapped by the lack of cooperation from the parents.

The effect upon the well-being of the infant, while there would appear to be a severe local reaction, is negligible. They nursed well,

slept well and showed no difference in general from infants not vaccinated.

The normal physiologic weight loss did not seem excessive or prolonged except in a few cases where it was not reasonable to ascribe the cause to the reaction. In general 75 per cent of the babies regained their birth weights by the eleventh day, while those who did not were no slower than many unvaccinated infants used as controls.

The temperature curves did not differ in any respect from the unvaccinated infants. In many showing severe reactions the temperature remained normal; this was the rule and not the exception. There were temperature rises of course but they occurred as often and as frequently in the unvaccinated and could not be directly ascribed to the vaccinal reaction.

The unaffected temperature in vaccinated infants is agreed to by Mensching and others. Mensching believes it is due to the normal physiologic property of the newborn of thermolability. It gives off heat rapidly due to its thin epithelium and preponderance of body surface over body weight. Ablatz explains the lack of fever due to an immunity to the vaccine, while Friedmann says the concentrated blood of the newborn can throw off the vaccinal reaction without the association of fever.

In our series there were two very severe local reactions with gangrene of the area and marked swelling of the axillary glands. These passed off subsequently with no ill effects to the infants. There were no cases showing exanthemata or other generalized reactions.

Unfortunately we were not permitted to revaccinate these babies at a later date in an endeavor to determine the permanency of the reaction. Mensching believes it to be as permanent as in the adult and Wolff states that in his cases vaccinated at birth there has been very little smallpox though there has been much exposure to it.

We do not believe there is a single instance in this series where intrauterine transmission of immunity to smallpox or to vaccination can be demonstrated or thought likely. If there is any immunity transmitted to the fetus in utero it is no doubt passive and not of sufficient consequence to protect the infant from either smallpox or vaccination. Supfle, Von Pirquet and others have demonstrated antibodies in the blood of vaccinated individuals but they were only transitory and of short duration. There is much doubt in the minds of Pfaundler and Mensching as to whether the placenta will transmit these except under very rare and exceptional circumstances, though Mensching believes the greatest possibility lies in mothers having a reaction at least eight days before the birth of the child, as at that time antibodies have been found in appreciable amounts in maternal blood.

From the appended tables it will be seen that we vaccinated 66 mothers from the eighth to the tenth month. Their infants reacted with 66 per cent positive vaccinations. From the first to the eighth

TABLE I

REACTIONS OCCURRING IN 200 INFANTS VACCINATED

	SERIES I	SERIES II
Total infants vaccinated	100	100
Total positive reactions	69	79
Total negative reactions	30	20
Undetermined reactions	1	1

TABLE II

SHOWING THE TIME OF THE MOTHER'S REACTIONS AND THE REACTIONS OF THEIR INFANTS

MOTHERS' REACTIONS	INFANTS' REACTIONS						
	No.	Pos.	%	Neg.	%	Und.	%
Recent positive	93	64	71.0	29	29.0	0	0
Remote positive*	12	11	91.6	1	8.4	0	0
Simultaneous with infant	26	26	100.0	0	0.0	0	0
Negative or immune	49	29	59.0	20	41.0	0	0
Having had smallpox	9	9	100.0	0	0.0	0	0
Undetermined	11	9	81.8	0	0.0	0	18.2

*Mothers who had positive reactions several years ago. They had not been revaccinated and would not permit vaccination at this time.

TABLE III

TABLE SHOWING THE PERIODS OF PREGNANCY OF THE MOTHERS WHEN VACCINATED, THEIR TYPE OF REACTION AND THE REACTIONS OF THEIR INFANTS

PERIOD OF PREGNANCY		MOTHERS' REACTIONS				INFANTS' REACTIONS		
Week	No. Vac.	Pos.	Neg.	Imm.	U.	Pos.	Neg.	U.
12	1	1	0	0		1	0	
15	1	1	0	0		0	1	
16	1	1	0	0		1	0	
23	2	1	1	0		1	1	
24	4	3	1	0		4	0	
26	7	7	0	0		7	0	
27	6	6	0	0		4	2	
28	9	6	2	1		7	2	
29	1	1	0	0		1	0	
30	9	2	3	4		3	5	1
31	5	4	0	1		4	1	
32	17	9	5	3		10	7	
33	2	1	1	0		1	1	
34	8	5	3	0		6	2	
35	5	3	1	1		1	4	
36	29	20	2	6	1	18	11	
37	7	5	2	0		5	2	
38	11	7	2	2		7	4	
39	4	2	1	1		4	0	
AD*	41	30	7	4		34	7	
SP not vac.†	7	0	0	0		7	0	
SP vaccinated	2	0	2	0		2	0	
RP‡	11	0	0	0		11	0	
Undetermined	10	0	0	0		9	0	1
	200	115	33	23	1	148	50	2

*Mothers vaccinated after delivery, not from dispensary.

†Mothers gave histories and evidence of having had smallpox. They did not permit vaccination except for the two cases noted.

‡Mothers having a positive reaction years ago. They did not permit vaccination at this time.

TABLE IV

SHOWING THE PERCENTAGE OF THE MOTHERS' AND INFANTS' REACTIONS ACCORDING TO THE PERIOD OF PREGNANCY IN WHICH THE MOTHERS' REACTIONS OCCURRED

PERIOD OF PREGNANCY	MOTHERS' REACTIONS				INFANTS' REACTIONS	
	% Pos.	% Neg.	% Imm.	% U.	% Pos.	% Neg.
1– 4 months	100.0	0.0	0.0	0.0	66.66	33.33
4– 6 months	66.66	33.33	0.0	0.0	83.0	17.0
6– 7 months	85.0	9.0	6.0	0.0	81.0	19.0
7– 8 months	50.0	25.0	25.0	0.0	56.0	44.0
8– 9 months	65.0	15.0	15.0	5.0	59.0	41.0
9–10 months	63.0	22.0	15.0	0.0	75.0	25.0

month we vaccinated 63 mothers whose infants reacted with 71.5 per cent positive vaccinations. In a much smaller group, in fact too small to be of value, were 12 mothers who had positive vaccinations many years ago with no revaccination. Their infants had 91.6 per cent positive reactions.

Thus it will be seen that there are no really significant figures in the two larger groups and from this we feel that the technic of vaccination and the strength of the virus are the most important factors in obtaining positive reactions.

The method of scarification used in Series II gave us 10 per cent more positive reactions than that by puncture used in Series I. It would seem from this that the former is the method of choice.

Immune reactions in the mother were those which, after vaccination, developed some local inflammatory change but did not develop into a typical reaction with the formation of a papule, vesicle, and pustule.

In the infant immune reactions did not occur. They were definitely positive or negative.

From the above there do not seem to be any really significant figures. It would seem, however, that if intrauterine transmission of immunity was an important factor we should expect a smaller number of positive reactions in infants whose mothers had positive reactions in the later months of pregnancy. The above figures do not tend to bear this out.

CONCLUSIONS

1. Pregnant women may be vaccinated at any time during their pregnancy without fear of obstetric complications. It would seem advisable, however, to set aside this precaution in cases of hyperemesis, hypertension and albuminuria.

2. Newborn infants should be vaccinated early. They bear the reaction well, in fact better than when vaccinated later. The more robust premature infants should be vaccinated when necessary; though we have no figures on these infants, Mensching's are signifi-

cant. Failure to obtain nearly 100 per cent positive reactions would indicate faulty technic or poor virus.

3. Intrauterine transmission of immunity to smallpox should not be taken into account as at best it is passive, slight and infrequent and not of sufficient consequence to protect the infant from either vaccination or smallpox.

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General Hospital.

PROTECTION OF THE CERVIX UTERI DURING LABOR*

By Archibald L. McDonald, A.B., M.D., F.A.C.S., Duluth, Minn.

SERIOUS and extensive lesions of the cervix uteri and surrounding structures are to be found in a large percentage of women who have borne one or more children. While this is most likely to result from operative delivery, it may also occur following apparently simple or spontaneous labor. In this connection I have reviewed the records of forty multiparae who have had their entire obstetric experience under my care. These were all private patients and it has been possible to follow their condition for from one to five years subsequent to their last labor. Thirty-one of this group, at examination made several months or more after the last confinement, showed no evidence of prolapse or of serious injury to the supporting structures of the uterus. Nine, or 30 per cent, have presented laceration of the cervix and prolapse of the uterus to such a degree that operative correction was advised. This percentage of serious sequelae is sufficiently high to warrant a somewhat detailed study concerning the causal factors and possible preventive measures. To a certain extent it will involve a review of well-recognized conditions; in other words a "research into the obvious." Sometimes, however, facts are so very obvious that they lose their significance and require emphasis and reiteration in order to receive proper appreciation.

Lesions of the cervix are important because of:

1. The immediate danger of hemorrhage and subsequent puerperal sepsis.

2. Later subinvolution and retroversion.

*Read before the St. Louis County Medical Society, May, 14, 1926.

3. Hypertrophy and eversion of the cervix.

4. Injury to the supports of the uterus and bladder resulting in prolapse of these organs.

These injuries are due to a tearing of the cervix, involving the vault of the vagina, and the adjacent tissues supporting the uterus and bladder; which process has replaced normal physiologic dilatation of these structures. In a consideration of the anatomy involved we have to deal with two closely associated factors: 1. The cervical canal. 2. The supporting structures surrounding the cervix in the region of its vaginal attachment.

The structure of the cervix has been much discussed. We must regard the uterus as a definite organ specially adapted to three functions: 1. Through its endometrium and blood supply, it is prepared to furnish attachment for the fertilized ovum, and through its adaptable circulation to supply nutrition in proportion to the increasing needs of the developing product of conception. 2. The muscular elastic wall provides protection to the contents, and at the same time permits expansion of the cavity in response to internal pressure. 3. Finally as a result of some undetermined stimuli the uterine musculature proceeds to dilate its principal orifice, expel its contents, and control the open bleeding vessels preventing excessive loss of blood. The entire process normally proceeds in an orderly manner without injury, followed by perfect restoration of the organ to its previous condition.

Physiology teaches that plain muscle of the uterine type is capable of retaining its functions of passive retractility and active contractility even in the face of extreme extension, provided this latter process be a gradual one. This is well shown in the behavior of the uterus during and following full term labor when the muscle still retains its passive and active functions in spite of the extreme extension of the individual fibers during pregnancy. This property is lost only in cases where the distension of the uterus has been excessive or rapid; hydramnios or intrauterine hemorrhage. In a similar manner the musculature of the cervical portion is adapted to undergo extension of its individual fibers to a degree of what is called complete dilatation, permitting the passage of the full term fetus. It still retains physiologic tone, retractility and contractility, all with no injury to the individual fibers. Normal first stage labor provides an ideal mechanism for accomplishing this process. The intermittent, gradually increasing contractions, acting through the intact bag of waters, furnish a perfect hydrostatic dilator which secures a harmless dilatation of the circular muscle bands. The normal presenting part, the well flexed head, engaging in the pelvis serves a double purpose. It protects the bag of waters from undue pressure during uterine contraction, and maintains dilatation of the cervix in the interval between contractions. A second more active factor in the process of dilatation

is provided by the longitudinal muscle bands extending from the body of the uterus into the cervical portion where they are interwoven with the circular fibers. It is commonly stated that contraction of the longitudinal bands tends to actively draw the circular muscles upward over the presenting part thus contributing an important factor in the process.

From the above considerations it is evident that any approach to violent distension of the cervical musculature will result in more or less extensive laceration of muscle fibers. Such violence may be the result of excessive or continued uterine contractions especially from the use of oxytoxics, as pituitrin; of premature rupture of the bag of waters and the substitution of the presenting part for the hydrostatic dilator; or of abnormal position of the presenting part. It goes without saying that any method of artificial or mechanical dilatation from the vagina introduces an element of violence and is certain to cause more or less injury.

The most important supporting structures of the uterus are in close proximity to the cervix. We recognize: 1. The fibrous triangular ligament attached to the pubic bones, supporting the bladder, surrounding and supporting the cervix, and continuous with the pelvic fascia attached to the sacrum about the rectum. 2. The pubocervical, and uterosacral ligaments and bands of musculofibrous tissues in this region and in the base of the broad ligaments. All of these structures are intimately associated with the cervix and with the vault of the vagina. They must always be considered as having been injured in lacerations involving either of the latter parts. During physiologic dilatation of the cervical canal and external os, the ligaments and fibromuscular supporting tissues are relaxed providing an opening in proportion to the dilated cervical orifice.

At the end of second stage labor these tissues are much distended and atonic, as is evident by the ease with which the cervix can be drawn to the outlet. Under favorable conditions these relaxed supporting structures are capable of undergoing spontaneous and complete return to normal during puerperal involution. Permanent damage may follow: 1. Tearing of the musculofibrous ligaments associated with laceration or violent divulsion of the cervix. Such lesions especially interfere with the support of the bladder resulting in cystocele and descent of the bladder attachment from the supravaginal portion of the cervix to the region of the external os. 2. On the other hand, continued subinvolution of the relaxed supporting structures is not uncommon, even in the absence of demonstrable laceration. This results finally in prolapse of the uterus but with no change in the relation of the bladder to the cervix. It simply represents a persistence of the mobility of the uterus which is present at

the end of second stage labor, increased by the continued pressure of a retroverted, subinvoluted organ.

The first stage of labor, then, secures complete dilatation and retraction of the cervix with relaxation of the surrounding supporting structures in the vault of the vagina, and is complete only when the largest diameter of the presenting part has passed through this region. It should be fully appreciated that anatomically and physiologically, the tissues in question are adapted to a normal method of function which protects them from injury and allows involution to the previous condition. It is certain that deviations from this normal process carry danger of more or less serious damage. Therefore such substitutes for physiologic dilatation must be adopted only upon sufficient indication. A procedure must be selected which will most closely imitate the normal process, or one which presents the most favorable opportunity for immediate repair.

Let us consider some of the methods which interfere with normal first stage labor.

Voluntary effort or bearing down tends to advance the presenting part in the pelvic cavity, but automatically carries with it the partly dilated cervix and vaginal vault, resulting in laceration or undue tension on the supporting structures. Since it serves no immediately necessary purpose, it should be discouraged or controlled by sedatives until dilatation is complete. We should not expect marked advancement of the presenting part during the first stage of labor.

Oxytoxic medication (pituitrin) by increasing the intensity of uterine contractions may have the same effect and is objectionable during this period. In addition, pituitrin often causes a tetanic, spasmodic contraction of the uterus with injury to the fetus as well as serious laceration of a rigid cervix.

Operative delivery through an incompletely dilated cervix is attempted much oftener than is commonly acknowledged. One can easily satisfy himself on this point if he will make a visual inspection of the cervix in all cases of forceps delivery, and of version or breech extraction. Again, dilatation is not surely complete until the presenting part has actually passed through the cervical ring. What is apparently a soft dilatable cervix frequently presents unexpected resistance to active extraction, and it tears into the fornix of the vagina, often involving the base of the broad ligament and the supporting structures to a marked degree. Such forms of operative delivery should be delayed till spontaneous or artificial dilatation has been secured. Following this type of delivery, thorough visual inspection must be made and all injuries carefully repaired. Some object that this involves undue manipulation and danger of infection. This would also apply to the original procedure and if one is justifiable both are, since the second is but the necessary completion of the first.

Instrumental dilatation has at present but few advocates and is generally condemned.

Manual dilatation of the partially dilated cervix by the Harris method is popular and is exceedingly valuable under proper circumstances. It would be well, however, if each of us would frequently review the technic and limitations. Williams places three restrictions. The cervical canal must be obliterated and the external os partially dilated and dilatable, it must be executed with great care by an experienced operator, and placenta previa must be excluded. There are two dangers. Undue haste or violence leads to tearing instead of dilatation; and surgical delivery if attempted before manual dilatation has been completed results in traumatic laceration, often of considerable extent.

Vaginal packing, as described by Polak and others, frequently induces softening and dilatation of the cervix in a satisfactory manner. It is objected that the procedure presents danger of infection and, of course, time is required.

The insertion of an elastic bag filled with sterile fluid gives the nearest approach to the physiologic process since it secures dilatation from within, by means of intermittent hydrostatic pressure transmitted from uterine contractions. If the bag is undisturbed by traction and does not rupture, it is rarely expelled till the cervix has been retracted and dilated to the greatest diameter of the bag. One often finds, however, that some further degree of dilatation must be obtained: by additional contractions, repeated use of the bag, or other method. While the procedure requires time and manipulation, and is not always completely successful, it acts in a harmless and physiologic manner.

Elective surgical incision of the undilated or partially dilated cervix is a most efficient and satisfactory procedure in suitable cases. Two methods are described: 1. Lateral incisions of the partially dilated cervix are adequate in some cases, but are likely to involve more of the vault of the vagina and supporting structures than is appreciated, or to extend during delivery resulting in hemorrhage and lacerations which are difficult to control. In most instances it will be preferable to select the second method, that of formal anterior vaginal hysterotomy, or so-called vaginal cesarean section. In this, the injury to the cervical canal is deliberately planned and controlled. Also immediate and satisfactory repair is always possible.

I have reviewed thirty personal cases in which operative delivery was deliberately undertaken when dilatation of the cervix was less than one-half completed, in each instance for well recognized indication. Manual dilatation was selected in twenty-two, or more than two-thirds of the total. Of these women, all had been in labor for from ten to more than twenty-four hours, so the cervical canal was

already obliterated, the external os soft, and dilated to at least two fingers. In ten, or less than one-half of this group, there was no immediate evidence of cervical laceration, and subsequent examinations have revealed no trace of serious damage. In four cases, or about 16 per cent, evidence of severe cervical laceration at once appeared, and immediate repair was done with satisfactory late results. In eight, or approximately 33 per cent, while there was no sign of severe injury at the time of delivery, subsequent examinations demonstrated laceration and hypertrophy of the cervix with some prolapse. Five of these eight were primiparae or had previously had spontaneous labor, while the other three had previously undergone surgical delivery. While this group is too small to permit of positive conclusions, the study leaves in my mind certain impressions. In more than half of such cases serious damage will result, which however can usually be corrected at once. This is especially likely to occur if the cervix is rigid, or if undue haste or violence is used. It is not a safe procedure in case of placenta previa or low implantation because of the danger of tears. Great care is necessary to secure full dilatation before delivery is undertaken.

Vaginal packing was not done in this series, though in certain instances it might have been of value.

The elastic bag was used only twice. Once in a multiparae with placenta previa followed by version and extraction of a living child. There was evidence of cervical laceration caused by rapid delivery before resistance of the cervical ring was entirely overcome. The general result however was satisfactory. The second use of the bag was in an elderly primipara with premature rupture of the membranes several days before the onset of labor. After the cervical canal was obliterated and dilated to two fingers, a bag was inserted and retained for eight hours before it was spontaneously expelled. The cervix was then about two-thirds dilated and the process was completed manually, followed by version and extraction. An extensive lateral laceration was at once repaired, but subsequent examination showed cystocele and prolapse.

Anterior vaginal hysterotomy was done four times with entirely satisfactory results. Reconsideration of my experience with these cases leaves the impression of having had perfect control throughout, and of having secured accurate anatomic repair, of all injury done.

The danger of serious and permanent injury is still present even when cervical dilatation seems to be complete, but with the presenting part still retained above the cervical ring. In this connection I have reviewed two series of personal cases. In a group of twenty in which podalic version was performed through a cervical ring considered as practically dilated, there was no immediate evidence of serious injury to the cervix. Subsequent examinations have demon-

strated laceration and hypertrophy of the cervix with some degree of prolapse in one of five primiparae, and in four of fifteen multiparae. The second series concerns a group of forty primiparae in which midforceps or Scanzoni operation was performed while the head was still within the cervical ring. In nine of these, laceration of the cervix was demonstrated and repaired at the time of labor. Later examination showed this result to be satisfactory in eight; one required secondary repair. Follow-up examinations have demonstrated laceration and hypertrophy of the cervix with more or less retroversion or prolapse of the uterus in nine of the remaining cases. In other words, nearly 50 per cent of this group showed immediate or late evidence of serious injury to the cervix or supporting structures of the uterus.

My impressions are quite definite. Podalic version and extraction can be performed with less danger of serious damage to the cervix and supporting structures than moderately difficult forceps delivery with the head still within the cervical canal. Serious injury may be expected in nearly one-half of such cases. Immediate repair gives satisfactory results and should be carried out at once.

CONCLUSIONS

1. Interference with physiologic processes in the first stage of labor causes serious injury in a considerable percentage of cases and should be undertaken only for sufficient indication.

2. One should carefully select the least harmful method and always look for injury to cervix and vaginal outlet.

LYCEUM BUILDING.

SPINAL ANESTHESIA IN CESAREAN SECTION FOR TOXEMIA OF PREGNANCY*

By B. G. M. Astley, M.D., Philadelphia, Pa.

IT IS not my purpose to go into a discussion of all the general measures used in the kidney breakdown of pregnancy, or of eclampsia, but simply to report results.

The development of the toxemia of pregnancy places two lives in danger. Statistics of the treatment of this condition quote first the maternal results, and accord fetal statistics an absolutely minor consideration. On the other hand, where reasoning has suggested and experience later apparently demonstrated the value of newer methods of treatment, so far as fetal mortality is concerned, then these newer methods should be given some consideration in the plans for treatment of a given case.

The situation with the victims of toxemia is briefly that, during the progress of pregnancy, either solely because of pregnancy, or because of antecedent pathology plus pregnancy, a condition develops which jeopardizes the life of the mother, and carries with it therefore at least an equal hazard to the life of the child.

In considering the treatment of the mother the therapeutic situation may be epitomized as follows: If reduction of metabolic activity by rest and by limitation of diet, and the increase of elimination of waste products by proper measures, do not bring relief, the question of termination of pregnancy is brought up. If termination of pregnancy is decided upon, the details of each step necessary to delivery must be considered and evaluated; and if the patient is seen in the crisis of eclampsia, the same consideration is no less necessary.

Since the crisis is the result of substances elaborated during pregnancy, since the continuation of pregnancy will increase the amount of these toxic materials, and since the reserve of resistance to these toxic substances is an absolutely unknown quality, it is logical to relieve the mother of the strain of the continuation of pregnancy, if this can be done without adding factors of risk greater than those already being faced.

Possible maternal dangers in a rapid delivery are:

1. Shock from traumatism, if delivery be attempted by the natural route where the parts, either because of the period of pregnancy, the age of the patient, or local conditions, are unyielding.

2. Infection of unavoidably traumatized tissues in the presence of lowered general resistance.

*Read at a meeting of the Obstetrical Society of Philadelphia, February 4, 1926.

3. The hazards of the anesthetic in the presence of kidney and liver incompetency, and of cardiovascular strain incident to high blood pressure.

As far as the child is concerned we have practically the same situation.

1. The child shares with the mother in the toxemia and enters life with that certain, though unmeasurable, handicap.

2. Rapid delivery entails more physical risk than one of deliberation.

3. Prematurity will lessen the resistance both to the toxemia and the physical strain of delivery.

4. The anesthetic used in the delivery of the mother may be sufficient to turn the tide against the child, where resistance would have been sufficient otherwise, by making resuscitation difficult.

We believe then, with the situation considered as outlined, that spinal anesthesia is the method of choice, to be used in the interest of the mother, in certain cases of toxemia of pregnancy because:

1. It allows of the most rapid emptying of the uterus, that is by cesarean section, with the minimum shock to the patient, because its action is that of a nerve block with complete muscle relaxation of the abdominal wall, permitting most expeditious work.

2. At the same time it gives us the benefit to be derived from lumbar puncture in the lowering of cerebrospinal pressure, and from the lowering of blood pressure which its use entails.

3. It adds no element of hepatic toxemia or renal irritation, and, as stated, reduces blood pressure instead of elevating it as oxygen and nitrous oxide may.

In the interest of the fetus spinal anesthesia is especially valuable where, because of marked toxemia or because of prematurity, fetal resistance is at a low point, because:

It adds nothing to the blood which may interfere with resuscitation, or with the functioning of any other already impaired vital processes. Its use is therefore particularly indicated where even more than average importance is attached to the life of the child, as in elderly primiparae who have had renal impairment antedating pregnancy, and where conception therefore may not be allowed to occur again.

I am herewith reporting a short synopsis of the cases of spinal anesthesia of Dr. Jesse O. Arnold and my own which have served as the basis from which the foregoing conclusions have been drawn.

Cases of Dr. Jesse O. Arnold.—

CASE 1.—Para i, age twenty, in seventh month of pregnancy. Toxemia and acute hemorrhagic nephritis. She had four convulsions before operation, cesarean, and two convulsions on table. She had one convulsion one and one-half hours later in which she died. Baby, which weighed less than four pounds, survived, and is healthy child now four years of age.

CASE 2.—Para i, age thirty-one, at term. Preeclamptic toxemia. No convulsions. Cesarean. Good recovery, both mother and child.

CASE 3.—Para i, age twenty-eight, at term. Toxemia, eclampsia. Four convulsions before operation. Cesarean. Three convulsions postpartum. Good recovery of mother and child.

CASE 4.—Para i, age thirty-four, in sixth month of pregnancy. Acute hemorrhagic nephritis, eclampsia. Four convulsions before operation. Cesarean. Two convulsions postoperative. The mother had good recovery, child died in three days. Prematurity.

CASE 5.—Para i, age twenty-three, at or near term. Toxemia, eclampsia. Three convulsions. Cesarean. Recovery of mother and child.

CASE 6.—Para i, age twenty-one, at term. Toxemia. Several convulsions before operation. Cesarean. Two convulsions after operation. Good recovery of mother and child.

CASE 7.—Para i, age nineteen, at term. Eclampsia, lobar pneumonia. Six convulsions before, eight after operation. Cesarean. Death from pneumonia on eighth day. Child recovered.

Cases of Dr. G. M. Astley.—

CASE 1.—Para i, age thirty-two, uterine deformity, seven and one-half months pregnant. Systolic pressure, 158. Trace albumin. Section determined by reason of deformity of uterus, malposition child, and risk of continuation of pregnancy because of tenseness of uterus. Child, 4 pounds, 9 ounces, survived.

CASE 2.—Para i, age twenty-eight, distinct bicornate uterus. Seven months pregnant. Fetus transverse; uterus tense, fetal parts not palpable and rupture appeared imminent. Cesarean. Child 3 pounds, 2 ounces, survived.

CASE 3.—Para i, age thirty-one, obese. First seen at four and one-half months, pressure then 180/90; at eight and one-half months; pressure 174/118. Edema, general headache, albumin, granular casts. No sign onset labor. Cesarean. Child 8 pounds, 8 ounces, survived.

CASE 4.—Same patient as case 3 two years later, at term. Repetition renal difficulties. Cesarean. Child and mother recovered.

CASE 5.—Para i, age twenty-seven, seven and one-half months. Eclampsia. Three convulsions before operation, two after. Cesarean. Both recovered, child 3 pounds, and 10 ounces.

CASE 6.—Para i, age thirty-three, six and three-fourths months. At this time developed insufficiency of a known, deformed, single kidney. Pressure increased from 160 to 210 systolic in twenty-four hours despite rest, diet reduction and elimination. Cesarean. Child 3 pounds, 7 ounces. No difficulty in resuscitation of child, but died suddenly two days later while nursing. Mother, good recovery.

To summarize then we have twelve patients, all primiparae, one twice operated upon, giving thirteen operations. Six patients are over thirty years of age. Seven patients have had convulsions, both before and after operation. Four others have had preeclamptic toxemia of high degree, and one of moderate degree. One patient without toxemia, but included to show value of spinal anesthesia in prematurity.

In this group two mothers died, one, with acute hemorrhagic nephritis as a climax to a stormy gestation from toxemia; the other of pneumonia, eight days postoperative, the eclampsia and pneumonia both present at the time of operation.

In this group among the children surviving, one weighed 3 pounds, 2 ounces; one 3 pounds, 6 ounces; one 3 pounds, 10 ounces; one 4

pounds, 9 ounces; one 5 pounds, 8 ounces. Two children died, one at six months, surviving three days, and one at six and three-fourths months, surviving two days.

The method of spinal anesthesia used was that employed at the Samaritan Hospital, Philadelphia, in the surgical clinic of Dr. W. W. Babcock.

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(For discussion, see page 117.)

CANCER OF THE CERVIX COMPLICATING PREGNANCY, SHOWING THE HARMFUL EFFECTS OF RADIUM ON THE FETUS*

By Joseph J. Mundell, M.D., Washington, D. C.

SINCE radium has come to be recognized as the choice of treatment in the vast majority of cases of cancer of the cervix, it is the purpose of this paper to call attention to the damage to the fetus that may result from the application of radium during pregnancy.

On December 3, 1920, the patient, a well-developed, well-nourished woman, aged twenty-five, was seen for the first time, complaining for the preceding two weeks, of malaise, vomiting and diarrhea. In June, 1919, eighteen months previously, she had been delivered by cesarean section after being in labor for two days. It was stated by her attendants that the cervix was rigid and did not dilate. She stated that her last normal period was three weeks preceding her visit to me but that since then she had bled for five days. Upon vaginal examination the cervix was found to be greatly enlarged, especially the anterior lip which was the site of a cauliflower growth. The uterus seemed to be only slightly enlarged and motility was limited. The examination caused excessive flooding, only controlled by tight vaginal packing. Thereafter bleeding continued more or less constantly until her removal to the hospital December 10, when a biopsy was performed and sections showed carcinoma. Section of the blood clots did not show chorionic villi. Considering the case to be inoperable, radium treatments were instituted. A total of twenty-one hundred and fifty milligram hours were administered in three treatments, on alternate days beginning December 17. Thereafter the patient's condition became much worse and two months later, on February 21, 23 and 25, 1921, a total of twenty-one hundred milligram hours was again applied. For two days following there was more or less constant cramp-like pain and on February 27 she aborted a three months' fetus. I was unaware that she was pregnant, thinking the increase in the size of the uterus was due to the advancing growth of the cancer.

The patient died September, 1921, nine months after the onset of symptoms. The disease seemed to progress more rapidly and to be more virulent than in any case I have seen, which bears out the observation that has been made often that cancer in young persons is of a particularly malignant type.

Cancer of the cervix associated with pregnancy is an extremely rare complication. The very nature of things seems to contraindicate such an occurrence. One usually thinks of cancer at the menopause and of pregnancy occurring in early adult life. Cancer, however, is not a rarity in the childbearing age. Also one might assume that condi-

*Read at a meeting of the Medical Society of the District of Columbia, May 12, 1926.

tions existing in cancer of the cervix, the hypertrophy, engorgement and bleeding would be a natural barrier to conception, but strange to say in most of the cases which I have collected, in the judgment of the reporters, cancer preceded the pregnancy. Such was undoubtedly true in my case. The relative frequency of this complication is a little difficult to determine. Sawey[1] published a series of cases in 1899 and gives its occurrence as once in every two thousand. B. C. Hirst,[2] in 1923, endeavoring to learn the frequency, sent a questionnaire to a number of obstetricians in this country and in a total of 299,621 pregnancies there were twenty-four cases of cancer of the cervix encountered or one in every 12,484. The high and low ratios were as follows: Asa B. Davis reported 137,966 pregnancies with five cases of cancer, or one in 27,599, while Mussey of the Mayo Clinic reported 3,500 cases in thirteen years with eight cases of cancer or one in 437.

Gross[3], in 1922, published one of the most valuable papers upon this subject, reporting thirty-four cases of cancer of the cervix observed within twelve months following either confinement or abortion. He stresses the point that a close follow-up should be kept for at least one year after confinement or abortion in women who are thirty years of age or over. Other writers since have dwelt upon the importance of this practice and no doubt a wide acceptance of it will result in an earlier detection of a number of cases of cancer of the cervix. Certainly it is to be commended.

While in the histories reviewed cancer preceded the pregnancy in most instances, yet there were cases in which it seemed that the cancer developed during pregnancy. A discussion of this phase would seem to have merely an academic value, without any practical significance.

Many heated discussions have been waged as to what effect pregnancy has upon cancer. If a debate should be arranged having for its subject, "Resolved that pregnancy has a deleterious action upon cancer of the cervix," quite a formidable array of articles could be collected upholding the affirmative side and also just as many, possibly more of the late papers, could be found espousing the negative. For the affirmative it is argued that the increase in the blood and lymphatic supply concomitant with pregnancy tends to favor the growth of cancer. Writers who support this view are Bumm,[4] Hoffmeier,[4] Koblanck,[4] Opitz,[4] Sawey,[4] Sellheim[4] and Zweifel.[4] For the negative it is claimed that the great increase in the connective tissue, the predominating tissue in the enlarged pregnant uterus, acts as a barrier to the aggressive cancer cells. As a matter of fact it is the connective tissue overgrowth which is a pronounced factor in controlling cancer by radium. There are some who maintain that there is present a hormone of pregnancy which tends to retard any neoplastic growth. Among the supporters of one or the other latter views

are: Sommers,[4] Weibel,[4] Wolf,[5] Mayer,[6] Fellner,[7] Senator,[7] Kaminer,[7] Kok,[8] Dieulofe.[9] The articles supporting the negative side are more recent than those for the affirmative and it would seem that the trend of opinion of recent observers is that pregnancy has a tendency to retard the growth of cancer. It is quite generally accepted, however, that after the termination of pregnancy cancer grows rapidly.

Even though the simultaneous occurrence of these two conditions is a rarity it will be well to bear them in mind if one sees bleeding in pregnancy in the late thirties or when dealing with known cancer of the cervix during the childbearing age.

The interesting feature in this subject concerns the treatment, especially since the advent of radium.

Uncomplicated by pregnancy the accepted treatment of the rare early case of cancer of the cervix is panhysterectomy. For all other cases, borderline or advanced, radium is advocated, if not as a curative at least as a palliative measure. We shall see what influence the existence of pregnancy has upon deciding the course of treatment.

Suppose one encounters an early operable case of cancer of the cervix complicating pregnancy at the third month. The only hope of cure is immediate hysterectomy. To delay the operation until the fetus reaches viability means that the mother's chance of recovery is jeopardized, if not forfeited, because only a few months' delay may mean widespread dissemination of the growth. As a matter of fact, however, early operable cases of cancer of the cervix with or without concomitant pregnancy are clinical rarities, seldom if ever seen. Whenever met, the indications are clearly cut for wide total extirpation.

Not so easy is the decision as to the method of treatment in cancer advanced beyond the operable stage, if pregnancy is coexistent.

In the borderline cases of cancer uncomplicated by pregnancy, that is, cases in which the disease is not widespread and the patient's general health is not materially impaired, there is some dispute as to the most efficacious method of treatment. A few still cling to operation combined with radium but the majority of gynecologists are becoming more and more of the opinion that with radium alone the best results are obtained. This trend of opinion is perplexing in the solution of the problem because it is attempted in this report to show that radium, when applied during pregnancy, has decidedly harmful effects upon the fetus. For some few years past we have been receiving reports from animal experimenters of the baneful effects to the offspring from radium and x-ray applied during pregnancy in mammals.

Von Hippel, Jr.,[10] with rabbits in the second week of gestation produced death of the fetus.

Schinz[11] interrupted pregnancy in the rabbit and cat.

Burchhard and Sebileau[12] lengthened the period of gestation by delayed embryonal development.

Schmid and Lewey[13] produced far-reaching damage to the brain, spinal cord and retina in lower vertebrates.

DeNobele and Lams[14] with twenty-two rats and twenty-nine guinea pigs produced undoubted evolution of pregnancy; in the majority of cases the fetus was killed; in others monsters resulted and irradiation seemed to favor production of ovarian cysts.

Since 1923 reports have also appeared of injurious effects on the human fetus from radium and x-rays. Enough cases have now been reported to convince us that pregnant women must not be subjected to applications of radium if there be any chance of their going to term. The same dictum applies to intensive x-ray treatment. Leading x-ray men, however, feel that there is no danger to the fetus from x-rays applied during pregnancy simply for diagnostic purposes.

The following case reports have been collected in which radium has been used during pregnancy without deleterious effect upon the child.

Bailey and Bagg[15]; one case of cancer of the cervix with normal baby at term, treated at the fifth month; and one case of epithelioma of vulva treated at six and a half months, baby at term four and a half pounds but otherwise normal.

Vital Aza,[16] radium treatment extending over three months, normal baby at term.

Cathals and Merat,[17] radium treatment third month, premature but otherwise normal baby.

Roche,[16] radium treatment fifth month, normal baby at term.

Hartman and Fabre,[18] radium treatment fourth month, normal child, five pounds, cesarean at eighth month.

Metzger and Legneu,[19] radium treatment third month, normal baby at term, forceps.

Schilling,[20] radium treatment seventh month, normal baby at term, cesarean.

Schweitzer,[21] normal baby at term.

Field,[22] radium treatment seventh month, normal baby, four pounds, spontaneous delivery at eighth month.

Werner,[23] small, but normal child.

Lawson,[24] fibroid and pregnancy, x-ray fourth and fifth month, normal child, cesarean at term.

Kane,[25] radium applied at second month of pregnancy for cervical polyp. Pregnancy not suspected. Cesarean section tenth month after protracted labor four days, due to rigid cervix. Fetus was dead at time of operation having succumbed during long labor. Fetus seemed to be about eight months.

Titus,[26] inoperable cancer of cervix complicating pregnancy at fifth month, treated with radium, 2400 milligram hours, spontaneous labor at term, normal living baby, seven pounds, ten ounces.

The following series present quite a different aspect, showing the harmful effects of radium on the fetus.

Bailey and Bagg,[15] glioma of cord in mother treated with x-ray and radium third month, cesarean at term, baby had spina bifida and double club-feet, died in fifteen days.

Siredy,[16] radium treatment fifth month, immediate abortion.

De Rouville,[16] radium treatment fifth month, abortion sixth month.

Ashenheim,[27] x-ray third to sixth months for fibroid, microcephalic imbecile, with optic atrophy.

Brindeau,[28] malformed baby following irradiation for fibroid.

Flatau,[29] microcephalic weak child, x-ray.

Seitz,[29] imbecility.

Naujoks,[29] injury central nervous system, eye damage, underdeveloped.

Apert and Kermogant,[30] mongolianism.

Schwaab,[30] microcephalic and dystrophic child.

Foveau de Courmelles,[14] change in fetus.

Abels,[31] microcephalic child, abnormality of eyes, x-ray for fibroid.

Stettner,[32] fibroid and pregnancy, treated with x-ray second month, underdeveloped, hypospadia, strabismus, deficient mentality.

Emil Ries,[33] x-ray treatments third month, diagnosis not stated, delivery at term, stillbirth, hydrocephalus and many other abnormalities.

Mundell, radium third month for cancer of the cervix, immediate abortion as above stated.

In a few of the case reports above quoted in which the babies are reported as normal, it is noted that the weights are five pounds or less. Even though no gross abnormalities can be detected certainly a five-pound baby is handicapped.

Fourteen out of twenty-nine cases resulting in abortion or malformed babies should be sufficient warning of the dangers from radium or x-ray applied during pregnancy. It would seem that the greatest damage resulted in those cases in which radium or x-rays were applied in the early months of pregnancy. It might be argued that in some of the case reports above quoted the deformities in the babies were not directly attributable to the effects of radium or x-ray but were rather due to the impoverished condition of the mother. Be that as it may, in each instance the reporter gave it as his opinion that the deformity was the result of radiotherapy. Also such malformations have not been noted heretofore in children born of mothers suffering with cancer of the cervix before the advent of radium treatment. Therefore it would seem to be safe to say that such conditions are not merely coincidences.

In many of the articles reviewed it seemed to be the sense of the writers that therapeutic abortion in the face of cancer entailed too much danger from trauma and hemorrhage to be considered at any time. Because of the same dangers, delivery at or near term was best accomplished by cesarean section in most instances.

Having a case of pregnancy before viability, complicated by inoperable cancer of the cervix, what treatment should be outlined? If there does not seem to be great infiltration beyond the cervix it might be well to extend the limit of operability and do a hysterectomy. However, in an acknowledged inoperable case hysterectomy is futile and as has been seen by this review there is too grave a risk to the welfare of the fetus to permit the use of radium. It would seem then that the only feasible procedure to adopt is to revert back to cauterization of the cervix, the mode of treatment in vogue before the

advent of radium. Especially should this method be adopted if radium is used with the idea that it is a palliative measure.

The practical lessons to be drawn from this study are two. The first is for the obstetrician, who should have cancer in mind when he finds bleeding during pregnancy in an elderly woman, and to be on the lookout for it for at least a year following confinement or abortion in women in the late thirties. The second lesson is for the radiologist, who should rule out pregnancy by searching history-taking and careful examination before treating either carcinoma or uterine fibroid during the childbearing age, because radium or x-ray applied during pregnancy entails much damage to the fetus.

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THE TREATMENT OF HYPEREMESIS GRAVIDARUM, WITH PARTICULAR REFERENCE TO THE USE OF GLUCOSE AND INSULIN: REPORT OF 18 CASES

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IN DISCUSSING treatment, it is pertinent that the condition treated be clearly defined if any conclusions are to be made from the clinical changes observed. We use the term hyperemesis gravidarum to include all those cases of vomiting occurring during pregnancy in which the vomiting is sufficiently severe and persistent to injure the patient's health. The train of symptoms—headache, insomnia, mental agitation, epigastric pain, constipation, thirst, dehydration, urinary and blood changes, etc.—are all due to or dependent upon the emesis. If we can control the vomiting, we can, of course, cure the patient. Irrespective of the intital etiologic agent, we assume that the patient vomits in spite of herself. Whether the vomiting was effected by neurotic tendencies or not, the case of *true* hyperemesis is one of uncontrollable and pernicious vomiting sustained by a vicious vomiting-starvation-acidosis cycle.

With the above postulates in mind, our treatment of hyperemesis has been directed against the immediate cause of the vomiting, i.e., the toxemia, as manifested by the blood and urinary findings. The blood findings are diminution in the alkali reserve and lowering of the CO_2-combining power, and rarely, lowered blood sugar. The urinary changes, other than those due to dehydration, are an increased ammonia coefficient, decreased urea output, and the presence of the ketone bodies.

We combat the toxemia indirectly by eliminating the circulating toxins and directly by oxidizing or neutralizing them. Elimination through the bowel is encouraged by the use of high colonic irrigations, following a cleansing enema. These are given once or twice daily. Renal excretion is of greater importance but less easily obtained. It presupposes a sufficient fluid intake which by virtue of the vomiting does not exist. Therefore, parenteral introduction of fluids must be resorted to. We employ rectal instillations of 10 per cent glucose and 5 per cent sodium bicarbonate in 120-200 c.c. amounts every four hours. If the bowel is intolerant, 1 c.c. camphorated tincture of opium is added to the instillation or the glucose is reduced to 5 per cent. If marked dehydration is present, hypodermoclysis of 1000 c.c. of physiologic saline solution is given. An intravenous injection of 10 per cent glucose and 5 per cent sodium bicarbonate is preferable,

however, given in amounts of 700-1000 c.c. Promotion of elimination through the skin is seldom stressed and the hot pack is rarely used.

The toxemia is treated directly by the use of alkalies, as outlined above, to raise the CO_2-combining power of the blood, and by the use of glucose and insulin intravenously to destroy the ketones. We have found the latter method, introduced by Thalhimer[1] in recent papers and employed by others,[2] to be of distinct benefit and attended by cessation of vomiting.

The amount of glucose-insulin and the frequency of its use obviously depend upon the conditions present. The vomiting-starvation-acidosis cycle of Thalhimer is broken up by overcoming the acidosis. Glucose is introduced and metabolized in large amounts, and by its metabolism carries to their final stage the ketone bodies which have been evolved by the starvation and which maintain the vomiting. It has been our experience that the patient stops vomiting *when the ketonuria disappears.* We therefore maintain the eliminative and combative measures until the ketones no longer appear in the urine.

We employ a chemically pure, freshly made, distilled water solution of 10 per cent glucose, and use 50-100 gm. at each injection, giving approximately 3-5 gm. of glucose for each unit of insulin. Thus, with 900-1000 c.c. of 10 per cent glucose (90-100 gm.) we give 20 units of insulin. This is repeated every twenty-four hours until there is definite clinical and laboratory evidence of improvement, the vomiting and the ketonuria being the indices. With a marked lessening of the ketonuria and increase in blood CO_2-tension, accompanied by cessation of vomiting following one injection, it is safe to withhold a second, pending change in condition. However, if more than one injection is required to control the vomiting, injections should be continued daily or oftener until there is complete absence of ketonuria. The importance of this is well emphasized in Case 8. The total fluid intake and output should be carefully recorded and the intake kept at or above 3500 c.c. in twenty-four hours.

With regard to purely symptomatic treatment, there is little to add. We use corpus luteum empirically and believe it to be of value in mild cases, used daily in 0.5 c.c. doses, intravenously. Adrenalin, 5-10 minims subcutaneously or 40 minims rectally, is of value when the blood pressure is low. Rectal instillations of chloral hydrate, gr. 20, and triple bromides, gr. 40 to 60, are often used to give much needed rest. Morphine may be substituted in ¼ gr. doses. Gastric lavage or drainage with a Rehfuss tube is sometimes of benefit. The multitudinous "specifics" for vomiting are not given, for we have never seen them give better than very transient or questionable relief. The use of salt solution by various routes has failed to relieve a number of patients who responded immediately to glucose-insulin intravenously.

CASE REPORTS

The following case report illustrates the effect of glucose-insulin intravenously after failure of another régime:

CASE 1.—E. B., aged twenty-four, para i, was admitted because of persistent vomiting of five weeks' duration. Marked weakness, prostration, and dehydration, severe headache, and epigastric tenderness were all present on admission. Urinalysis showed acetone 4-plus, and diacetic acid 4-plus. For two days the patient was given 2 c.c. of corpus luteum intravenously, daily; high colonic irrigations daily; fluids by Murphy drip continuously. On the third day the patient was weaker than on admission and the ketonuria was still as intense. She was then given 900 c.c. of 10 per cent glucose and 30 units of insulin intravenously. There was no emesis following this, and in twenty-four hours the ketonuria had practically disappeared. The patient was discharged at her own request seven days after admission. Her subsequent course was normal.

The next report is typical of those patients who were given glucose-insulin intravenously without recourse first to other measures:

CASE 5.—M. P., aged twenty-three, para i, six weeks' pregnant, was admitted to the hospital after having been in bed for eleven days because of vertigo, prostration, precordial pain, nausea, and frequent vomiting. For four days she had vomited everything taken by mouth. Examination showed marked prostration and dehydration, heavily coated tongue, and enlarged heart with an apical systolic bruit. The blood pressure was normal. Urinalysis showed a faint trace of albumin, acetone 4-plus, and diacetic acid 2-plus. She was given 1000 c.c. of 10 per cent glucose and 15 units of insulin intravenously. The vomiting stopped after the injection and did not recur. The ketonuria disappeared in twenty-four hours and the patient was discharged after nine hospital days, fully recovered and apparently in good health.

The following case report illustrates the most severe type met with, and shows the importance of persistence until the ketonuria is overcome. It is this group in which therapeutic abortion often seems imperative, but which we believe to be rarely indicated and often the terminal insult.

CASE 8.—A. P., aged twenty-nine, para ii, six weeks' pregnant, was admitted to the hospital because of persistent vomiting of all food for two weeks. She had been in bed for the first three months of her first pregnancy and had vomited until its termination. When admitted, December 21, 1924, marked prostration and dehydration were evident. Blood sugar was 94; acetone and diacetic acid were present in the urine. She was given daily colonic irrigations, corpus luteum injections, chloral and bromides by rectum, and high carbohydrate diet. Vomiting persisted for three days, when she was given 500 c.c. of 10 per cent glucose and 20 units of insulin intravenously. There was no vomiting for three days, then at intervals until January 4, when 1000 c.c. of 10 per cent glucose and 20 units of insulin were given intravenously. There was no improvement, and a beginning jaundice was noted. January 6 the injection was repeated, with 30 units of insulin. The following day there was general abdominal pain and tenderness, especially in the hepatic area. Gastric lavage and the duodenal tube were resorted to. The urine continued to show acetone and diacetic acid in large amounts. The next day the patient became very restless and irrational, vomiting frequently, and complaining of severe epigastric

pain. Slight jaundice was present over the entire body. One thousand c.c. of 10 per cent glucose and 30 units of insulin were given without apparent effect. Rectal instillations of 250 c.c. of 10 per cent glucose, and 5 per cent sodium bicarbonate, every four hours, were given and continued until January 15. On January 10 the patient's condition was very poor. There was intense general jaundice, marked liver tenderness with diminution in size, intense vomiting, and ketonuria. One thousand c.c. of 10 per cent glucose with 15 units of insulin were given. On January 12 the injection was repeated by hypodermoclysis, as most of the veins had been used in withdrawing blood or in previous injections. On January 13 there was no change in her condition. Three thousand c.c. of glucose solution and 30 units of insulin were given by slow hypodermoclysis, taking three and one-half hours. After absorbtion of this amount, 1750 c.c. of glucose and 17.5 units of insulin were given by hypodermoclysis. The following day the jaundice was distinctly less, diacetic acid was absent from the urine for the first time since admission, and the acetonuria was 2-plus. The patient was vomiting mucus and froth frequently. Two thousand c.c. of 10 per cent glucose and 30 units of insulin were given by hypodermoclysis over a period of four hours. On January 15, the patient stopped vomiting for the first time since December 27. She was extremely weak, still jaundiced, and the breasts were very sore. The urine was clear of ketone bodies and there was glycosuria of 1.2 per cent (25.2 gm.). From this date on, recovery was rapid. Coincident with the disappearance of the ketosis, the albuminuria lessened, casts and red cells disappeared, and the jaundice lightened daily, and was gone in five days. On January 22 the patient was strong enough to be up, and on January 30 she was discharged as cured. The subsequent course of her pregnancy was normal.

COMMENT

Of the 18 patients represented by this series, 13 were treated with high carbohydrate diet, saline hypodermoclyses, sufficient fluid intake, corpus luteum intravenously, and symptomatic treatment of various kinds before intravenous injections of glucose and insulin were used with curative effect. There was one recurrence (Case 7) which promptly responded to treatment. The entire series of 18 would be classified under the "serious or pernicious" grouping of Titus,[3] for exhaustion, emaciation, dehydration, beginning nephritis or early jaundice were singly or severally present, and acidosis was present in every case listed. One injection caused cessation of vomiting in 14 patients within twenty-four hours and the average hospital duration of these was thirteen days.

The clear-cut results which have attended our procedure, as contrasted in our experience with others, using only glucose solutions[2, 3] or fluids freely,[6] seem to emphasize the advisability of using insulin and glucose intravenously in the treatment of hyperemesis gravidarum.

SUMMARY OF CASES

Total number of cases	18
One injection sufficient	15
Cessation of vomiting within 24 hours	14
Hospital duration of the above class	12 days

Hospital duration of others 24 days
Duration of symptoms before treatment 10 days to 6 weeks
Blood sugar lowered in 3 cases: 78 (2), 86.2 (12), 82.4 (14) mg. per 100 c.c. blood.

I am indebted to Dr. S. A. Cosgrove for his interest and guidance in caring for the majority of these patients on the Obstetrical Service at the Jersey City Hospital.

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644 West Side Avenue.

AN EXCELLENT SUBSTITUTE FOR BREAST MILK

By D. A. Calhoun, M.D., Troy, N. Y.

UPON the obstetrician of today rests the responsibility of providing the means whereby the baby obtains the proper start in life and continues to remain in health while under his care. In undertaking this responsibility he is beset with many difficulties, and paramount among these is the all-important question of weight. The infant who is sufficiently nourished will be contented, healthy, and gain weight; but given an infant which is not gaining, consequently not contented, a multitude of difficulties make their appearance. The question of infant mortality is directly concerned with gain in weight. Infants gaining properly are healthy. Maternal nursing, of course, is the aim of our endeavor, but when there is an absence, or an insufficient amount of breast milk, the infant can be made to gain by artificial means.

Artificial feeding, therefore, becomes necessary under the following conditions:

Babies both full term and premature when the breast milk is absent.

Complementary feedings when the mother's milk is inadequate, either in quantity or quality.

Artificial feeding when the baby is weaned.

The first needs no comment. A maternal supply, foreign to the baby, is at best difficult to obtain and artificial milk becomes necessary.

Secondly, supplemental feeding is becoming more and more prevalent. The food which will halt a faltering weight curve and guar-

antee a prompt and efficient return of the baby's weight to normal is the one of choice, whether it be only a temporary or a permanent feeding. How often one sees the infant under the quiet régime of the hospital thrive and surpass its birth weight, only to falter and lose ground after reaching home. Symptoms of insufficient nourishment make their appearance in spite of all attempts to regulate the mother's diet or the use of galactogogues. It then becomes necessary to supplement the deficiency with artificial food.

Lastly, babies weaned during the first year require artificial food.

Under these various conditions, what artificial food shall be used? It must be one to which the baby will immediately adapt itself without difficulties or ill effect, and at the same time one on which there is immediate gain of weight without vomiting, restlessness, or intestinal upset. In fact, the formula chosen must be one which will replace the normal breast milk with all of its advantages, as near as is humanly possible.

After experience with many infants, under the three previously mentioned conditions, I have found the lactic acid milk of Mariott and Davison to fulfill all of the above conditions, and now use it to the exclusion of all other formulae, with very successful results. I have not yet seen it fail in a single instance, and the old adage of four ounces gain a week seems to be passing into oblivion. Infants on this form of nourishment surpass that figure regularly, and it is not at all uncommon to see them gain as much as a pound a week. This weight is equally distributed to all the elements of the body, thereby promoting proper growth and good health. After a few days on this formula, the weight begins to increase and continues steadily; the baby is soon content and only awakens at feeding time. The babies are all placed on a three-hour schedule and the last feeding is given at ten o'clock after which sleep is enjoyed until the following morning. The so-called colic, so troublesome with many babies on other forms of nourishment, is almost unknown. The digestion is thorough and complete as is shown by the perfectly normal stools and the absence of either constipation or diarrhea.

Without going into detail, the theory upon which this type of milk is based is briefly as follows: All milk contains a certain so-called buffer substance, that is, a substance capable of uniting with considerable amounts of acid, or alkali, without undergoing any great change in its chemical reaction. Breast milk contains a very small amount of this substance; it therefore neutralizes the normal hydrochloric acidity of the stomach to a minimal degree, thereby making breast milk readily, quickly, and completely digested in quantities adequate for the needs of the growing infant. Cow's milk, on the other hand, contains large amounts of the substance and consequently neutralizes considerable amounts of the hydrochloric acidity in the

stomach, thereby decreasing the digestibility and making it difficult or sometimes impossible to feed the infant sufficient quantities to maintain a proper nutritive balance. Cow's milk should, therefore, in some way be acidified in order to compensate for the acid neutralization referred to above.

Carbohydrate deficiency should be supplied by the addition of proper quantities of some form of sugar easily digestible and assimilable. Corn syrup not only contributes the lacking caloric and nutritional value, but also furnishes the needed carbohydrate in the form of dextrose, the fully converted form into which every sugar or carbohydrate substance must be changed before absorption and assimilation occurs. This promptly absorbable and assimilable form of sugar produces no irritation of the gastrointestinal mucosa and throws no strain on the digestive function.

Lactic acid milk is easily prepared as follows:

1. Use only a good grade of cow's milk, which need not necessarily be pasteurized.

2. To each pint of milk add two tablespoonsfuls of Karo Corn Syrup and mix thoroughly.

3. Boil the milk for five minutes. If the mixture is brought to a boil and allowed to simmer rather than boil vigorously the evaporation is less and the results just as good.

4. Allow the milk to stand in a cool place until thoroughly chilled; overnight in the ice box is preferable.

5. With a medicine dropper, add drop by drop with gentle stirring, one teaspoonful of lactic acid, C. P., 85 per cent, to each pint.

6. Store in a cool place until used.

TABLE I

BIRTH	6 MONTHS
7 Lb. 3 Oz.	18 Lb. 0 Oz.
6 " 4 "	14 " 0 "
8 " 2 "	14 " 3 "
6 " 10 "	18 " 0 "
8 " 8 "	19 " 0 "
3 " 3 "	12 " 3 "
8 " 3 "	18 " 2 "
7 " 6 "	21 " 0 "
8 " 4 "	17 " 0 "
9 " 4 "	21 " 0 "
6 " 8 "	17 " 0 "
8 " 0 "	23 " 0 "
7 " 5 "	15 " 2 "
7 " 0 "	23 " 0 "
7 " 5 "	18 " 0 "
9 " 0 "	21 " 0 "
7 " 8 "	23 " 0 "
7 " 2 "	17 " 0 "
3 " 5 "	15 " 0 "
8 " 6 "	18 " 0 "
7 " 3 "	17 " 2 "

In order better to appreciate the value and advantages of this food, I have tabulated the weights of some of the infants fed exclusively on this milk (Table I). The weights at birth varied from three pounds in premature infants to nine pounds in full-term babies; the average weight is seven pounds and three ounces. At the end of six months, several of the babies weighed as much as twenty-three pounds. The average weight at the end of this time is seventeen pounds and two ounces. This is better than double the birth weight by three pounds.

It is pertinent to mention that the state of health of these babies was perfect throughout the entire period of six months; not in a single instance had there been a single day of illness of any character.

The advantages of this form of infant feeding are that it permits feeding whole milk in practically the same quantities as the normal breast-fed infant obtains, with an almost completely converted sugar content, which is in a condition for ready absorption, without appreciable digestive effort or irritative effect on the intestinal mucosa. It furnishes the mother with a very easily prepared food of normally unchanged formula, which is simply increased in quantity as the infant grows older. Due to the inhibiting effect of the acid on the bacterial growth, the food is substantially free from pathogenic bacteria, and keeps perfectly when ordinary precautions are used. The acidification of the milk promotes coagulation of the curd, thus rendering the protein element more readily digestible and absorbable.

108 Second Street.

THE RESULTS OBTAINED IN TREATED AND UNTREATED CASES OF SYPHILIS IN PREGNANT NEGRO WOMEN

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THREE hundred and fifty women having four-plus Wassermanns were studied. Two hundred and twelve of these had no antisyphilitic treatment. The remaining 138 had treatment that was, on the whole, inadequate and started late in pregnancy.

It is hard to get the class of people with whom we have to work to take antisyphilitic treatment during pregnancy. It is just as hard to get them to come to the prenatal clinic early in pregnancy.

We are, at this time, treating our syphilitic pregnant women once a week. They get 0.45 of a gram of neosalvarsan and a mercurial inunction. Mixed treatment with protiodide of mercury and potassium iodide is started. This treatment is continued just as long as we are able to make the patient take it.

Of the 212 patients having no treatment, 106, or 50 per cent, produced full-time, apparently healthy babies. In the 138 treated patients, 101, or 73 per cent, went to term and delivered live babies.

A full term stillbirth occurred 14 times, or 6.6 per cent, in the untreated cases; in the treated cases 2 times, or 1.4 per cent.

Premature stillbirths occurred 58 times, 27 per cent, in the untreated cases and 10 times, or 7.3 per cent, with the treated.

Three babies of the treated cases had positive cord Wassermanns; two of these had had only one treatment and the other, four; treatments were begun late in pregnancy. No cord Wassermanns were made on seven of the treated babies, but the treatments were as follows:

2 had 1 treatment beginning about the ninth month
1 had 2 treatments beginning about the seventh month
1 had 2 treatments beginning about the eighth month
1 had 3 treatments beginning about the fifth month
1 had 6 treatments beginning about the fifth month
1 had 1 treatment beginning (?)

Of the 212 untreated patients 34 babies, or 16 per cent, were premature but alive. Twenty-three of these had negative cord Wassermanns; eight were strongly positive, and on three no test was done. Seven of these premature babies died in the hospital; four of these had a negative cord, two a positive, and on one the test was not done.

There were 27, or 10.8 per cent, premature live babies among the 138 patients treated. No cord Wassermann was done on three of these babies. On nine the test was strongly positive, weakly positive on one,

and on fourteen it was negative. Three of these twenty-seven babies died before leaving the hospital. The treatments given the mothers of the nine babies with positive cord Wassermann tests were:

2 had 4 treatments beginning about the eighth month
1 had 2 treatments beginning about the eighth month
1 had 5 treatments beginning about the sixth month
1 had 3 treatments beginning about the eighth month
1 had 1 treatment beginning about the third month
1 had 1 treatment beginning (?)
1 had 3 treatments beginning (?)

One had 18 treatments beginning about the fifth month. This premature baby died in the hospital.

The mothers of the 14 premature babies with negative cord Wassermanns had the following treatment:

MOTHERS	MONTH STARTED	NO. OF TREATMENTS								
		2	3	4	5	6	7	8	9	10
1	2							1		
1	3									1
5	6			1	1	1	1	1		
2	7		1	1						
3	8		2	1						
1	9	1								

One had two treatments, month not given.

The prenatal treatments of the mothers and the cord Wassermanns on the 101 full term babies born alive, follow:

On 5 babies the test was not done.

1 had 9 treatments beginning about the fifth month
1 had 7 treatments beginning about the fifth month
1 had 10 treatments beginning about the fourth month
2 had 6 treatments beginning about the eighth month

On 3 babies the test was weakly positive.

1 had 3 treatments beginning about the fourth month
1 had 4 treatments beginning about the sixth month
1 had 4 treatments beginning about (?)

On 12 babies the test was strongly positive.

MOTHERS	MONTH STARTED	NO. OF TREATMENTS					
		1	2	3	5	7	9
1	2				1		
1	6	1					
3	7			1		1	1
5	8	1	2	2			

Two had 2 treatments, month not given.

The 80 mothers who had 81 full time babies with negative cord Wassermanns were given the following treatment:

MOTHERS	MONTH STARTED	NUMBER OF TREATMENTS															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
4	2												1				
5	3						1	1	1	2	2						
5	4				1	2	1				1	1				1	
8	5	1	1		2	1	2	1		1							1
19	6	2		4	2		2		1	3		1		1	1		
10	7	2	1		2		2	1	3								
10	8	4	4	2													
4	9		4														

The remaining 15 mothers had from 1 to 12 treatments each. The months in which the treatments were begun, were not recorded.

SUMMARY

Fifty per cent of the mothers who had no treatment had full term live babies.

Seventy-three per cent of the treated mothers had full term live babies.

In the nontreated cases 6.6 per cent terminated as full term stillbirths.

In the treated cases 1.4 per cent terminated as full term stillbirths.

In the nontreated cases 27 per cent had premature stillbirths.

In the treated cases 7.3 per cent had premature stillbirths.

In the nontreated cases 16 per cent of the babies were premature but alive. Seven of these babies died in the hospital.

In the treated cases 10.8 per cent of the babies were premature but alive.

The cord Wassermanns done on the babies of the untreated mothers were positive in 31 per cent.

The cord Wassermanns done on the babies of the treated mothers were positive in 19 per cent.

(Cord Wassermanns are rarely done on stillbirths. If routinely done this disproportion would be much higher.)

There were no severe reactions. The earlier treatment is started the more effective it will be.

61 Forrest Avenue.

THE UMBILICAL CORD ENCIRCLING THE NECK AND ITS RELATION TO INTRAPARTUM COMPLICATIONS

By Lawrence E. McCaffrey, M.D., C.M., Ann Arbor, Mich.
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THIS study is based upon 3,000 confinements at the University Hospital, of which number 814 (21.1 per cent) were multiparae, and 2,186 (72.9 per cent) primiparae. In the group there were forty-one twin pregnancies, nineteen occurring in multiparae and twenty-two in primiparae, which demonstrate the comparative frequency in multiparae as compared with primiparae. There were, then, 3,041 births in the series.

The position of the fetus in all cases has been divided into left or right sided. In thirty-three cases the position was not stated. The relative positions in multiparae and primiparae were found to be very nearly equal. The difference of 4 per cent in the left sided positions might be explained by the larger number of undifferentiated positions in multiparae which were all precipitate labors. (See Table I.)

Table I

Relative Number of Positions in Multiparae and Primiparae

POSITION	NUMBER	PER CENT	MULTIPARAE (833) NUMBER	PER CENT	PRIMIPARAE (2208) NUMBER	PER CENT
Left	1903	62.6	497	59.8	1406	63.6
Right	1105	36.3	309	37.0	796	36.1
Not stated	33	1.1	27	3.2	6	0.3

Cephalic and breech presentations have been grouped together in order that the tables prepared might not be too cumbersome. The above figures are practically the same as those of Williams and other accepted authorities.

In 482 cases (15.8 per cent) the umbilical cord encircled the neck. This percentage seems to be lower than in series studied in other clinics. Williams states that it occurs about once in every four deliveries. G. Veit, in 2250 cases, found the cord around the neck on 442 occasions or about 20 per cent. Hecker and Ohlfeld reckoned the percentage about the same, while Von Winckel thought the percentage was slightly higher. Bruttau in 500 cases found it in 29 per cent. In our series the condition was present 152 times or in 18.3 per cent of the multiparae, while it was present in 330 or 14.9 per cent of the primiparae. We are inclined to explain our relatively low percentage of cases by the fact that a large majority of our cases were primiparae, while in most clinics the great majority of patients are multiparae. Our own statistics show that the condition occurs 3.4 per cent more often in multiparae than in primiparae.

In considering the number of coils around the neck in each case, it was found that the cord encircled the neck only once, four times as frequently as it did twice, three times and four times combined. The percentage of the respective number of coils as compared with the total was as follows: One coil, 78.6 per cent; two coils 18 per cent; three coils, 2.7 per cent; and four coils, 0.7 per cent. Smolibocki in 1000 births in the Breslau clinic found 125 cases with the cord encircling the neck. He found one coil in 74.5 per cent of cases, two in 12.3 per cent and three in 3.2 per cent. Weidemann, in 3,379 cases where the cord was around the neck, found it encircled only once in 76 per cent. Smolibocki makes no note of any case where there were more than three coils. We noted three cases where there were four coils but none with more than this number. However, cases with many more coils about the neck have been reported. Strassman observed a case with five coils; Winckel saw a case with six coils; Wygotski one with seven; Credé a case with eight; and Gray reported a case where it was nine times around the neck. In our series all numbers of coils were found to be more frequent in multiparae, with the exception of the three coil group where it occurred five times more frequently in primiparae. This was looked upon as a coincidence. (See Table II.)

TABLE II

RATIO OF COILS IN MULTIPARAE AND PRIMIPARAE

PARA	ONE COIL		TWO COILS		THREE COILS		FOUR COILS		TOTAL	
	NUMBER	PER CENT	NUMBER	PER CENT	NUMBER	CENT PER	NUMBER	PER CENT	NUMBER	PER CENT
Multiparae	119	14.3	30	3.7	1	0.1	2	0.2	152	18.3
Primiparae	260	11.8	57	2.5	12	0.5	1	0.1	330	14.9

A rather remarkable finding was the total number of cases where the cord encircled the neck in relation to the position of the fetus in the pelvis. This condition of the cord was found 6.2 per cent more frequently in right sided than in left sided positions. This is nearly one and one-half times as frequent. We are unable to give any satisfactory explanation for this seemingly great difference.

TABLE III

NUMBER OF COILS IN RELATION TO POSITION

POSITION	NUMBER	PER CENT
Right	220	19.9
Left	260	13.7
Not stated	2	6.0

In left sided positions there was only 1 per cent difference in the frequency of the condition in multiparae and primiparae. The greatest difference was found in right sided positions where in both mul-

tiparae and primiparae the condition was present much more frequently than in cases of the opposite side. But in multiparae it was present in 7.4 per cent more cases than it was in primiparae; that is, it occurred in more than one quarter of all multiparous births where the position of the fetus was right sided.

TABLE IV

RATIO OF COILS IN RELATION TO POSITION

PARA	LEFT		RIGHT		NOT STATED	
	NUMBER	PER CENT	NUMBER	PER CENT	NUMBER	PER CENT
Multiparae	72	14.7	78	25.5	2	9.6
Primiparae	188	13.4	142	17.8	0	0

Again we must admit we are unable to explain this finding unless the cord is more frequently placed around the neck in such a way as to rotate the fetus toward the right side. This seems rather improbable and as we have no data regarding the direction in which the cord encircles the neck, it remains merely an opinion. Further study on this particular phase of the subject is being started and we hope to be able to give some definite findings in the future.

There was a total of forty-eight cases of persistent occiput posterior position. Of this number the cord encircled the neck in fifteen cases or 31.2 per cent. Although the percentage is not very high it is very suggestive that the cord encircling the neck may cause some deflection in the attitude of the fetus, causing the rotation posteriorly. Winckel states that he believes the condition may be the cause of many cases of malposition.

In the 3,041 births there were eighty-nine cases of asphyxia neonatorum. There were twenty-three cases of asphyxia pallida and sixty-six of asphyxia livida. All cases were considered as asphyxia where the infant did not breathe without some kind of artificial stimulation, although this measure was not resorted to in many cases for a considerable period of time. There were sixty-one stillbirths in the series, of which eighteen were among the cases also considered as asphyxia.

In only two cases of the total number of asphyxias and stillbirths were we able definitely to attach the etiology of the condition to the umbilical cord encircling the neck. Curiously also, these were the only cases in which the condition might have been the cause of dystocia.

CASE 1.—Mrs. R. E., age forty-one, white, housewife, para xi. Previous pregnancies and labors uneventful. Labors usually lasted about one hour with first excepted, which was about six hours in length. Patient went into labor at term and after an hour and a half the cervix was found to be fully dilated. The pelvis was normal. The position was O. R. A. and the head was found to be floating. Five minutes later the membranes ruptured. The contractions kept up and were severe in character but there was no advance of the head. After an hour and twenty

minutes the head began to descend to the perineum. After the birth of the head it was found that there was a very tight coil of cord around the neck which was pushed over the shoulder with difficulty. On the birth of the baby it was found that there was no pulsation of the cord nor could any heart action be detected. The fetal heart was regular twenty-five minutes before the baby was born. On examination of the cord it was found to be congested and contained large clots from the umbilicus to the point where it encircled the neck a distance of 13 centimeters. From that point to its placental attachment the cord was collapsed and slightly greenish in color. As the baby weighed only seven pounds and as there was no evidence of any moulding, it was thought quite possible that the cord might have had something to do with the relative increase of the second stage of labor. However, this is difficult to explain for the cord was 83 centimeters in length.

CASE 2.—Miss E. D., aged seventeen, school girl, para i, at term. Pregnancy normal. Pelvis normal. Position O. R. A. The membranes ruptured when the patient went into labor. After nine hours the cervix was fully dilated. The head was high in the pelvis and remained stationary for more than an hour, then began to descend. At this time it was noted that the fetal heart which had been regular up to this time had disappeared. The labor was allowed to go on normally as the baby had obviously died. The perineum dilated slowly and after the birth of the head a very tight coil of cord was found around the neck. It could neither be pulled down nor pushed over the anterior shoulder. It was therefore clamped and cut. It was found to be congested and blue from the umbilicus to a point 7 centimeters beyond the clamp on the maternal side, and collapsed from there to the placenta. The total length of the cord was 59 centimeters. The baby's head was very slightly moulded. It weighed six and three-fourths pounds.

Although we could not prove this relatively short cord, considering the coil around the neck, was the cause of the arrest of the fetus in a normal position and attitude, the evidence points in that direction. However, there seems to be little room for doubt that it was the cause of the intrapartum death of the fetus.

A case is reported from Credé's clinic where the cord was so tight that the neck was only the thickness of the finger. In neither of our cases could any imprint of the cord be made out on the neck after the birth of the child. Hillairet saw a three months fetus with a coil of cord around the neck so tight that the neck was only 1 mm. in thickness. Other cases of strangulation have been reported by Bartscher, Blume, Fraenkel and others. Strassmann reported a case which he called intrauterine suicide, in which the fetus was born dead fourteen days before term. The cord was very tight about the neck and was thought to be the cause of death. R. Meyer showed in a 12 cm. fetus that there was engorgement of the cord on the fetal side of the loop and the right umbilical artery was ruptured. Of course the above cases are mostly of antepartum death but there is every reason to believe that many of the same conditions may obtain in intrapartum death. Antepartum complications were very thoroughly investigated by Browne recently. Winckel believes that a coil or coils of cord about the neck may produce deflection attitudes, hinder descent and rotation and prevent descent of the shoulders. He also believes that the condition may cause bleeding from premature

placental separation, rupture of the cord and even inversion of the uterus.

CONCLUSIONS

1. The umbilical cord encircles the neck more frequently in multiparae than in primiparae.

2. The umbilical cord encircles the neck nearly one and a half times more frequently in right sided than in left sided positions. This is particularly noticeable in multiparae.

3. In occasional instances the umbilical cord encircling the neck may cause dystocia, either from causing deflection attitudes or traction, and many other complications.

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BLOOD DYSCRASIA COMPLICATING PREGNANCY AND PUERPERIUM, WITH A REPORT OF TWO CASES*

By Solomon Krell, M.D., New York City

Case 1.—A woman of nineteen, born in Armenia; in United States five years. Ten years ago patient was sick for one month with fever, during which time she was exceedingly pale. A diagnosis was made of "pale sickness" which, in Armenia, is the popular term for malaria. She apparently made a complete recovery from that ailment. Menstrual history normal. Gravida 2, para i, miscarried at 3 months one year ago. Soon after she became pregnant, she was very pale and weak. These symptoms, however, cleared up following a spontaneous abortion and she regained her normal health within a month.

Present Illness.—Last menstrual period began Dec. 25, 1924, labor expected Oct. 1, 1925. Patient felt well throughout pregnancy except for slight nausea and vomiting in the first three months. About three weeks before admission to the hospital patient stated that she, as well as her friends, noticed that she was growing pale. Except for a slight feeling of weakness she had no other complaints until she entered the hospital. July 28, 1925, examination revealed a systolic murmur at the right base and a blood pressure of 130 over 40. She was seen once more on Aug 18, 1925, at which time she felt well. No mention is made on the chart of any pallor. Urine negative. On Aug. 30, 1925, patient was admitted to the hospital in labor. She was delivered of a normal male baby, breech presentation, seven hours after admission.

When patient was first seen at the hospital she presented the appearance of one who had just suffered a severe hemorrhage. Her face was extremely pale with a

*Presented at a meeting of the Section on Obstetrics and Gynecology of the New York Academy of Medicine, December 22, 1925.

somewhat yellowish tinge, her lips were almost white, yet, curiously enough, she complained of hardly any weakness or indeed of any other discomfort except her labor pains. Blood pressure was 150 over 80, no bleeding from anywhere. Spleen was not palpable; slight swelling of the ankles. Blood examination (before delivery), R. B. C., 1,350,000; Hgb., 28; W. B. C., 2,400; polymorphonuclear leucocytes, 32; lymphocytes, 68. There was anisocytosis, polychromatophilia, poikilocytosis and a few normoblasts. Urine showed albumin one-plus, acetone two-plus.

The following day the hemoglobin dropped to 15 with less than 1,000,000 red cells, her temperature rose to 101.5°, pulse 90, respiration 30. Five hundred c.c. of citrated blood were given intravenously Aug. 31, 1925. The day after the transfusion her temperature rose to 103°, then dropped sharply to 99° and from then on until her exitus it varied from 101° to 106°. On several occasions preceding a sharp rise in temperature patient had a chill that lasted a half hour.

Following the transfusion her hemoglobin rose to 25, and within two days dropped back to 15. Two days after the first transfusion a blood examination showed bleeding time forty minutes; clotting time fourteen minutes; bilirubin dilution 1 to 150; cells, one-fourth volume of total blood; no clot retraction after two and one-half hours; platelets 64,000; Van den Bergh test positive for indirect reaction. The smear presented the same characteristics as on the previous examination.

September 6, 1925, a second transfusion of 500 c.c. of citrated blood was given. Again there was a slight rise in hemoglobin which dropped back to 15 in two days. During this time her spleen became palpable, patient was losing ground perceptibly, uterine bleeding increased, pulse grew weak and she became moribund. Four days later a splenectomy was performed preceded and followed by transfusions of whole blood. Soon after the operation uterine bleeding increased, hemoptysis and epistaxis set in, pulse grew weak, and respiration became labored. She expired within forty-eight hours after the operation.

The necropsy showed acute degenerative cardiac changes and emboli with petechial spots scattered over the endocardium. The lungs presented pulmonary edema and a small infarct. The liver showed acute degenerative changes, the kidneys an acute nephritis. The uterus showed an acute, septic endometritis. The spleen weighed 260 gm., consistency was normal and microscopic examination showed evidence of sepsis. Uterine and splenic cultures revealed Streptococcus hemolyticus.

The baby was discharged in normal condition.

Discussion.—The patient remained in the hospital long enough to allow a thorough investigation of the case, yet the various antemortem examinations together with the advantages of a partial autopsy did not help to establish an exact diagnosis. The postmortem findings together with the mode of death clearly suggest sepsis. But the woman came to our notice with a blood condition well advanced towards an unfavorable outcome, and if that blood condition was not directly responsible for the actual death, it was certainly the determining factor in the production of complications. The history of the case with all the findings is by no means indicative of any sharply defined blood disease. The onset, particularly its occurrence during pregnancy, would suggest an acute pernicious anemia. The blood picture, however, does not bear out this diagnosis. For pernicious anemia is essentially a megaloblastic anemia, and no megaloblasts were found in any of the smears, nor was the hemoglobin index as high as is commonly found in pernicious anemia. The next disease

that would suggest itself is purpura hemorrhagica. Here the blood findings are more consistent, particularly the fact that the platelets were found so low in number, as well as the prolonged bleeding time and absence of clot retraction. The one serious objection to this diagnosis is the absence of purpura. It must also be remembered that the patient did not bleed from any part of the body until after delivery when it was noticed that the uterine bleeding was excessive. Hemorrhage from other mucous membranes did not set in until shortly before death. A diagnosis of purpura hemorrhagica in the absence of the two most outstanding clinical features of this disease is unwarranted.

Another diagnosis considered was acute lymphatic leucemia. Here both clinical and laboratory findings are highly suggestive since on repeated examinations the lymphocytic count was high. But we also had smears that showed a lymphocytic count of not more than 30 and such findings were not discovered shortly before death as is sometimes the case with leucemia. Banti's disease, we believe, can be easily ruled out for the reason that neither the clinical nor the pathologic features pointed to this. It must be remembered that Banti's disease is essentially a chronic ailment with enlargement of the spleen preceding the anemia and liver changes and ascites late in it course.

We are forced to conclude that we are here dealing with a toxemia of pregnancy which manifested itself chiefly in the form of a blood dyscrasia. The signs of sepsis which complicated the picture in the puerperium must be looked upon as secondary to a blood condition which was dangerously approaching a state of incompatibility with life.

Tice describes a condition which he calls "hemolytic anemia of pregnancy." This resembles our case in many respects. For want of a more plausible or more certain diagnosis we conclude that ours is a case of this type.

CASE 2.—A woman of twenty-four, nativity Russian, eleven years in United States. Admitted to hospital June 1, 1925, in labor.

Her last regular menstrual period began Aug. 7, 1924; labor expected May 14, 1925. Patient felt weak throughout pregnancy and suffered with frequent headaches which she attributed to some pills taken in the second month to bring on menstruation. Menstruation began at thirteen, periods irregular, coming on at three- to five-week intervals, flow lasting five days, dysmenorrhea the first two days.

Patient stated she was always prone to bleed profusely from the slightest cause, particularly so after her last confinement.

On April 16, 1925, swelling of feet was noticed and petechial spots scattered over the body. Blood pressure was 150 over 80. During her later visits to the prenatal clinic she complained of headache, weakness, ecchymotic spots over the body and bleeding from the gums. Urine showed a faint trace of albumin and a few red cells. Patient went into labor June 1, 1925, and was delivered the same day of a normal male child.

On admission to the hospital, patient had a yellowish pallor, body and extremities

were covered with petechial and ecchymotic spots ranging in diameter from 1/6 to 1/4 cm. Mucous membranes were pale. Heart sounds were normal except for an accentuated second pulmonic. There were occasional crepitant râles over both bases.

Blood examination showed: R. B. C. 2,400,000; Hgb. 30; W. B. C. 15,000; polymorphonuclear leucocytes 80; lymphocytes 20. Smear showed anisocytosis, poikilocytosis and normoblasts. Up to June 27 blood examination varied: R. B. C. from 1,500,000 to 3,000,000; Hgb. from 30 to 50; bleeding time from 3.5 to 32 minutes; clotting time from 3 to 10 minutes; platelets from 40,000 to 50,000. There was always a moderate leucocytosis with an increased polymorphonuclear count. These variations were probably influenced by the blood transfusions which she received at frequent intervals.

After June 27 we observed a steady decrease in red blood cells, a lowered hemoglobin, increased bleeding time, decreased number of platelets and poor clot retraction. Patient was bleeding from the gums and blood was found in the urine and stool. As the disease progressed uterine bleeding increased.

Temperature on admission was normal, soon after delivery it rose to 101°; on third day postpartum it rose sharply to 105°; from then on it was irregular ranging from 100° to 103°.

Between June 6 and July 8 patient received six transfusions with only transitory improvement in general condition and blood picture. She was also given horse serum and human blood intramuscularly, calcium lactate orally, x-ray over the spleen and tonic and supportive treatment. None of these therapeutic measures were of any avail; new crops of petechiae continually appeared. The second week in July the patient began to lose ground rapidly; uterine bleeding increased, heart action weakened and on July 12 patient expired. Baby was discharged from the hospital in normal condition.

This is a case of purpura hemorrhagica complicating pregnancy and puerperium.

Discussion.—A review of the literature shows that purpura hemorrhagica is an exceedingly rare complication of pregnancy, only 39 cases having been reported up to 1923. In a report of a similar case G. C. Mosher reviews eleven others reported in the literature. It appears that the complication occurs most often in multiparae; the attack usually becomes manifest between the sixth and seventh months of gestation with a purpuric rash and bleeding from various parts of the body. The outcome, particularly if the patient goes to full term is generally fatal, death occurring from within a few days to a few weeks postpartum. The baby as a rule is normal.

A comparative study of the two cases of this report reveals points of unusual interest. While the predominating feature of both cases is the severe grade of anemia and while the gestation in both instances probably bears an etiologic relation to the anemias, there is nevertheless a decided difference between the two. Whereas the first case entered the hospital in her eighth month without any history of loss of blood, the second patient showed the main features of a purpura hemorhagica two months before she was delivered. It is fair to assume that the anemia of the second case was at least in part caused by the loss of blood from the gums and into the skin. The first patient, on the other hand, reached an alarmingly severe type of anemia

without having lost any blood. Evidently in this case direct insult was suffered by all the formed elements of the blood giving rise to a picture not unlike that of an aplastic anemia. Another point corroborative of the secondary nature of the anemia in the hemorrhagic purpura case, is the constantly high leucocytic count as contrasted with the decided leucopenia of the first case.

Practically all authorities agree that in the severer grades of anemia incident to pregnancy, transfusions yield prompt and satisfactory results but where the blood dyscrasia assumes the character of an aplastic anemia or purpura hemorrhagica, the outlook is very gloomy and in most instances hopeless.

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1802 CLINTON AVENUE.

Department of Maternal Welfare

CONDUCTED BY FRED L. ADAIR, M.D.

MATERNAL MORTALITY: THE RISK OF DEATH IN CHILDBIRTH FROM ALL DISEASES CAUSED BY PREGNANCY AND CONFINEMENT

THIS report, the work of Dr. Robert Morse Woodbury, formerly director of statistical research for the Children's Bureau (*United States Department of Labor, Children's Bureau, Publication No.* 158, 1926) brings together and analyzes all available material, both American and foreign, on deaths of mothers during childbirth and is considered one of the most important pieces of recent research in the field of the Bureau's work. Children's Bureau officials feel that it indicates the necessary emphasis during the coming decade in the effort to reduce deaths among both babies and mothers.

High Maternal Mortality Rate in the United States.—Maternal mortality rates in the United States are today among the highest in the civilized world and only a slight decrease in these rates has occurred since the beginning of the present century, Dr. Woodbury's report states. The significance of these facts from a national point of view is found not only in the loss which this means of the lives of women presumably in their prime, but also in the far-reaching effect of maternal mortality on the infant death rate. Dr. Woodbury points out:

"A very considerable proportion of all deaths of infants under one year of age occur during the first month of life from causes which have their origin in the care and condition of mothers during pregnancy and confinement. In the United States as a whole it may be estimated that approximately 100,000 deaths of infants under 1 month of age occur every year. Reduction in the mortality from these causes depends upon improvement and extension of facilities for prenatal, confinement, and postnatal care. It may also be estimated that at least 100,000 stillbirths occur each year. The same measures which will safeguard the lives and health of mothers during pregnancy and labor will also tend to reduce the stillbirth and neonatal mortality rates."

Dr. Woodbury estimates the total annual number of maternal deaths in the United States on the basis of 1921 birth-registration area statistics to be 18,281. However, a careful survey of sources of error in certifications of death throughout the area leads him to the conclusion that the true number of maternal deaths is probably as much as 12 per cent in excess of those reported, making an estimated yearly death toll of more than 20,000 women. The maternal mortality rate in 1921 was 6.8 per 1,000 live births. The provisional 1924 rate was 6.6.

Trend of Maternal Mortality Since 1900.—Figures showing the trend of maternal mortality over a twenty-two year period in the United States, if accepted at their face value, would show an increase in the maternal death rate from 13.3 per 100,000 population in 1900 to 16.9 in 1921, according to the report. However, analysis of various factors affecting these statistics, particularly the campaign for better certification of the causes of death during recent years, would indicate in reality a "very slight downward trend" since 1900.

Comparison of the United States rates with those of other countries shows that the United States ranks among those having the highest rates, such as New Zealand and Chile. Among the countries having rates less than half that of the United States are Denmark, Finland, Italy, Japan, the Netherlands, Norway, Sweden, and Uruguay.

Causes of Maternal Mortality.—Analysis of the causes of maternal deaths in this country shows that the most important single cause is puerperal septicemia, due to infection resulting from lack of surgical cleanliness and almost 100 per cent preventable through careful asepsis. Two-fifths of the maternal deaths in the death-registration area of 1921 were due to septicemia. Among other causes, puerperal albuminuria and convulsions were most important, contributing over one-fourth of the deaths. This cause is preventable through competent medical care during the prenatal and confinement period. Other causes of death included accidents of pregnancy, hemorrhage, accidents of labor.

Factors affecting the risk of maternal death are analyzed by the report. Statistics indicate that the risk of death to the mother is greater in the case of plural than of single births and greater for mothers under fifteen and over forty-five years of age than to those between fifteen and forty-five. The lowest mortality is found among mothers between twenty and twenty-four. Maternal mortality, like infant mortality, is higher in first births than in second, third or fourth births, lowest of all for third births, and gradually higher with each birth after the third until the maximum death rate is reached with the eighth and later children.

Poverty an Important Factor.—As with infant mortality also, poverty is found to be an important factor in maternal death rates, these increasing as the husband's earnings fall, probably because of lack of proper facilities and adequate care for the poor mother. Color and nationality are also important factors in maternal mortality. In the birth-registration area for 1921 the negro maternal death rate was 67 per cent higher than the white rate. On the other hand, the rate for foreign-born white mothers was slightly lower than that for native white mothers. Among the nationalities included in the foreign-born white group, the rate was lowest for mothers born in Russia, and next to lowest for mothers born in Italy. At the other extreme were the rates for mothers born in Ireland, Great Britain, Canada, Hungary, and Germany. The racial stocks represented in the nationalities for which the rates were highest are, it is pointed out, those which principally compose the native white population.

City and Country Rates.—Cities showed a higher maternal mortality rate than rural districts in the United States, according to the 1921 figures, but to some extent this difference is to be accounted for by the fact that many of the more difficult or complicated cases are brought from rural regions into cities in order to secure the better medical and hospital facilities of the city. The classification of cities into groups according to size brings out the interesting fact that the highest mortality from puerperal septicemia was found not in the large centers but in the group of cities which had populations of 25,000 to 50,000. Except for the rural areas the largest cities had the lowest rate.

Maternal Mortality Largely Preventable.—The preventability of maternal mortality is considered in the light of the analysis of causes and causal factors, by the Children's Bureau report. "Almost all the mortality from puerperal septicemia is preventable," the report states. "Puerperal septicemia is infectious in origin, and its prevention depends upon the rigorous observance of asepsis. The Australian committee appointed to study the causes of death and invalidity in the Commonwealth states: 'Puerperal septicemia is probably the greatest reproach which any civilized nation can by its own negligence offer to itself. It can be prevented

by a degree of care which is not excessive or meticulous, requiring only ordinary intelligence and some careful training.' ''

Recommendations for Prevention.—For the prevention of the most important causes of maternal deaths the essential recommendations by the Bureau are: Effective supervision by a public-health agency over hospitals and over the training and admittance to practice of physicians, midwives, and nurses, and the requirement that all cases must be reported, as in the case of other infectious diseases. The experience of Norway is cited. In that country puerperal septicemia was early made a reportable disease and measures of public control were instituted. The result has been the elimination of four-fifths of the cases of the disease and the virtual elimination of deaths from it. Similar striking decreases have occurred in England and Wales and the Netherlands. Of special interest as a demonstration of what can be done in a large city in this country are figures from New York City showing a steady drop in the rate from 4.1 in 1900 to 2.5 in 1921, a rate still considerably higher than those for the countries mentioned, however.

Other puerperal causes of death may be prevented in a large proportion of cases by proper prenatal and natal care of the mother. Studies in this country, including the demonstration in New York City of the Maternity Center Association and the Henry Street Settlement, as well as evidence of physicians and public health authorities here and abroad, have shown the value of competent medical supervision in the reduction of rates from these causes.

The problem of prevention is, therefore, summarized by the Children's Bureau report as that of insuring to every mother skilled assistance before and during childbirth. The question of the extent to which mothers in the United States are today receiving such care is discussed on the basis of the scattered information available. In Baltimore, in 1915, with an excellent medical school and hospital and well-developed clinics, nearly half of all married mothers having babies during that year had no medical prenatal care of any kind and only 5 per cent had received care that could be classified as Grade A. In Gary, Ind., in 1916, 70 per cent of the mothers had not received any medical prenatal care. In rural districts studies indicate on the whole an even smaller porportion of mothers receiving prenatal care. Although these studies, made by the Children's Bureau, relate to a period from four to eight years ago, and the campaign of popular education on the subject as well as the establishment of prenatal clinics had probably increased somewhat the percentages of mothers receiving adequate medical attention during the period before the birth of their babies, even yet the proportion is, according to the Children's Bureau, probably very small. Attendance by physicians at the birth of the baby is reported for larger proportions of mothers, varying from 97 per cent in Nebraska to 51 per cent in Louisiana. Evidence is not available, however, as to the qualifications of the attendants at birth. Postnatal care is reported on for the cities of Baltimore and Gary and shows that a large proportion of the mothers did not receive supervision after birth.

A PREVENTIVE PROGRAM

The preventive program suggested by the report, in its main outline, follows:

1. Regulation of the practice of obstetrics, by requiring a license to practice from both physicians and midwives, by establishing minimum requirements for obtaining such a license, and by defining and prescribing penalties for malpractice.

2. Regulation of public and private hospitals and maternity homes through legal provisions governing the establishment of such institutions and requiring that they be licensed and subject to inspection.

3. Legislation for the control of venereal diseases including the making of these diseases reportable.

4. Requiring that puerperal septicemia be made reportable, as is now the case in a number of states.

5. Provision through governmental or public sources of better facilities for training medical and nursing personnel and more adequate clinics, hospitals, and maternity homes.

6. Subsidies in aid of state or local activities by federal or state governments, as in the United States during the past four years through the Maternity and Infancy Act.

7. Educational work directed toward informing mothers of the need of adequate maternity care.

F. L. ADAIR.

Society Transactions

OBSTETRICAL SOCIETY OF PHILADELPHIA

MEETING OF FEBRUARY 4, 1926

(Continued from December, 1926, issue)

DR. B. G. M. ASTLEY read a paper on **Spinal Anesthesia.** (For original article, see page 83.)

DISCUSSION

DR. J. O. ARNOLD said he used the procedure rather extensively in a considerable variety of cases, including forceps deliveries, cesarean sections, and other operative work, until he became pretty well acquainted with the technic and the class of cases in which it was of most value.

He thought that with this, and the more recent intravenous use of magnesium sulphate, we have made some very real progress in the handling of our eclampties, and in the treatment of the graver toxemias.

In the past year or more he discarded the use of morphine and other narcotic drugs, and substituted entirely the intravenous use of magnesium sulphate, and this, together with the use of spinal anesthesia where immediate delivery by cesarean section is indicated, was undoubtedly giving better results, and proving to be more nearly the ideal method of treatment. In the cases reported by Dr. Astley, which are only a few out of a much larger series that have had spinal anesthesia, there was a special indication for this method. Not only is this true as regards its value in helping to save the premature, or otherwise endangered child, but it certainly has decided advantages over other methods of anesthesia in its relationship to early and efficient elimination after operation.

In this respect there appears to be something in common between magnesium sulphate intravenously and spinal anesthesia. Both seem to favor rather than hinder elimination. Normal, or effective elimination, is resumed earlier, and patients clear up quicker mentally, and this greatly aids in their further treatment.

This was very well illustrated only a few days ago, in an eclamptic patient brought in by ambulance, unconscious for hours, and having exceptionally violent convulsions. After venesection and two intravenous doses of magnesium sulphate, she had but one more convulsion, and in less than three hours was conscious and clear mentally; her kidney elimination began remarkably early and satisfactorily. She did not require an anesthetic for delivery, but there would have been no fear that spinal anesthesia would have hindered these good results, had its employment been necessary.

Dr. Astley referred to two cases that were of such unusual interest that Dr. Arnold wanted to say more about them,—the two patients that had acute hemorrhagic nephritis.

In one of these the hope of saving the mother was extremely small. She was practically moribund and the operation was only successful in saving the child. This baby weighed less than three pounds, was very much premature, and frail. She is now more than three years old and a strong, hearty child.

In the second case, the pregnancy had not reached six months and there was no hope of saving the child. The mother had rapidly become desperately ill following

an acute influenza. Spinal anesthesia certainly did save the mother as he did not believe she could have been as quickly and as safely delivered by any other method. Even local anesthesia would have taken more time where time was an extremely important factor, and would not have given the beneficial after-effects on kidney elimination that were so marked in this patient and that practically always do result so much more promptly after spinal anesthesia than after any other.

The ease and help that this method gives to the operation itself is by no means an unimportant factor. The uterus contracts well, and there is less hemorrhage, and one can operate more quickly and more satisfactorily. There is also a very noticeable absence of the gastrointestinal and other postoperative disturbances and this is no small item in the welfare of desperately ill patients.

DR. J. STUART LAWRANCE said that if this study has been offered from the standpoint of an operating anesthesia that renders the radial treatment of eclampsia more safe it is very interesting; but if the study has been offered as one more reason for the radical method of treating eclampsia, then it is not so satisfactory. The radical treatment of eclampsia is based on fallacy as to etiology, and that in a mortality larger than 15 per cent. It is very possible for a small series of twelve to fifteen cases to show a smaller mortality than 15 per cent, but no large series has been shown, except that phenomenal series Freund reported in 1908 for which he scoured Europe; he collected a number of cases and operated on them within one or two hours of first convulsion. The best mortality record to my knowledge, in the treatment of eclampsia, belonged to the conservative treatment; that is, the treatment of the Rotunda plus the method advised by Titus, of Pittsburgh, plus the suggestion Dr. Williams made two years ago, for in a large series of cases there is a mortality of 8.75 per cent.

DR. RICHARD C. NORRIS said that there are two distinct topics for discussion: the treatment of the preeclamptic state and of eclampsia, and what anesthetic shall be used for cesarean sections, especially in eclampsia. Now as to cesarean section for eclamptic cases, it takes large numbers of cases, as the Doctor has said, to obtain worthwhile conclusions. Stroganoff's expectant treatment has a mortality around 8 per cent, Dührssen's vaginal hysterotomy, for the preeclamptic and the eclamptic patient, so popular a few years ago, showed a total mortality of about 8 per cent. These are the best statistics that have been offered and they represent the extremes of routine operative and nonoperative treatment. Eclampsia varies in its manifestations and varies so much in the extent of pathologic conditions in the patient that one cannot be too careful in drawing conclusions as to the value of a routine plan of treatment. Dr. Norris repeatedly operated on comatose eclamptic patients without any anesthetic. Some of them have recovered and some have died. The pendulum of prompt surgical treatment swings in one direction and swings back again, all of which means that we do not know in which cases it may be necessary, in which it may be harmful. We cannot differentiate accurately the degrees and types of toxicity with certainty, and then declare that a particular case requires cesarean section. The condition of the soft parts is perhaps the most important guide. The question of infant mortality depends upon how gravely toxic the mother is and upon the prematurity of the infant.

Dr. Arnold referred to his three-pound baby. A year after premature babies are born is the time for studying the infant mortality. If we study a large group of eclamptic mothers giving birth to premature and toxic babies, even by cesarean section, it will be found, at the end of a year, that a large proportion of these babies will not be alive. We know that is true when the mothers do not have eclampsia. It is one of the disadvantages of induction of labor, in preeclamptic mothers prior to term. Cesarean section is the most rapid method of opening the birth canal, and there are obstetric complications that require opening the birth

canal by this rapid means, but relatively few eclampsia cases belong in this class. The condition of the soft parts, in the presence of obstetric emergencies, determines what means one shall employ in the vast majority of cases. The important problem is, how necessary is speed in the delivery? In eclampsia, in Dr. Norris' judgment, it is not nearly so necessary as in central placenta previa or accidental hemorrhage. Resort to this method of opening the birth canal for all cases of eclampsia will not show in the future any better results than in the past. We must know more about the pathology,—the intimate pathologic changes in the individual case, before we can assert the necessity for rapid delivery. The mere rapid emptying of the uterus in the vast majority of cases in eclampsia amounts to very little in saving life. He had seen patients die just as quickly after the rapid, as after the slower methods and others survive, usually, however, when the type of toxemia was not severe. The mortality of severe cases after cesarean sections is almost double that of less aggressive methods. Because a woman is eclamptic, has had a greater or less number of convulsions, is or is not comatose, is not the indication. Dr. Arnold spoke of prenatal care and there lies the important treatment of eclampsia—its prevention. At the Preston Retreat toxemia cases have been reduced over one-half; however, some cases of the fulminating type continue in spite of careful prenatal work. Spinal anesthesia as a routine means of anesthesia did not appeal to Dr. Norris as having any special advantage over local anesthesia in eclampsia, and he believed that in a large group of cesarean sections it would not show as low a mortality as nitrous oxide and oxygen. When all surgeons of experience accept spinal anesthesia as a routine procedure it will be in order to use it for cesarean sections.

Dr. Norris did not doubt that as time goes by we shall be doing cesarean sections more and more, as a safe means of opening the birth canal. The important thing is to learn when it is necessary. Proof must be forthcoming that spinal anesthesia is of specific advantage in eclampsia before he would accept it as less dangerous than nitrous oxide. Cesarean section is one of the easiest operations and much less difficult from the standpoint of abdominal wall relaxation from the anesthetic. For that reason one of the disadvantages of nitrous oxide does not obtain. All his experience and knowledge acquired from the experiences of others, made him believe that cesarean section is only exceptionally indicated in the treatment of eclampsia. For a primipara with no effacement of the cervix, rigid soft parts, and the fulminating type of eclampsia which the clinical history and study indicate as probably of hepatic or endocrinal origin, cesarean section may be justified, while carrying out the appropriate medical and intravenous treatment.

DR. ASTLEY said in closing that he tried to make clear that this was an individual method. He supposed Dr. Arnold and he had cases in which spinal anesthesia was not used. Dr. Norris stated the method of spinal anesthesia is still *sub judice*. He admitted that it is in some situations. As a protection against nerve shock Dr. Astley believed local anesthesia is all right, but who would like to do a cesarean section on a patient in a convulsion? A local anesthetic will not serve if your patient has a convulsion on the table. When under spinal anesthesia if a convulsion develops, the patient will be convulsed from her nipples up and the anesthetist can put a mouth gag in place and you can keep on doing the work. He believed because of collected statistics in this group of individuals over 30 years of age whose cervices are long, whose soft parts are unyielding and where one can ordinarily make no promise of a child, the family can be told of a method of anesthesia which does not add danger to the mother as much as ether or chloroform, or gas and oxygen and have an anesthetic which we are confident has less danger to the child than any other. Dr. Astley felt that the position taken is worthy of consideration. He would say that these patients who did die were the most complicated cases, one with eclampsia and lobar pneumonia coexistent, the other of a comatose type.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Selected Abstracts

Endocrinology and Ovarian Transplantation

Benthin, W.: The So-Called Puberty Gland. Medizinische Klinik, 1924, xx, 169.

There is no agreement concerning the claim that the interstitial cells of the ovary in the human exert a protective influence on the maintenance of the female sex characteristics and on sex life. Experiments with x-rays and a review of the literature have made the author doubtful of the existence of the so-called puberty gland, a term applied to the fat-containing theca interna cells which surround atretic follicles.

Physiologically the interstitial cells are most numerous before puberty, but with the advance in age they become more and more insignificant. Even as early as the thirtieth year the number of primary follicles is small. There is an increase in the number of interstitial cells just before the menses and during pregnancy.

The formation of new interstitial tissue does not end with the menopause for although the formation of corpora lutea may cease, follicles still remain. In pathologic conditions, a hyperemia which affects the follicle apparatus will lead concomitantly with the increase in follicle atresia to an increase in the interstitial tissue. This explains the preponderance of the latter tissue in cases of chorioepithelioma, soft myomata and acute pelvic infections.

In some animals, as the rain worm and amphibians there is no interstitial tissue at all. Hence the secondary sex characters are dependent upon the sex cells alone.

The interstitial tissue cannot be the cause for the maintenance of size and function of the uterus because the interstitial tissue is best developed before puberty and is still present in advanced old age after the uterus has been atrophied a long time. Furthermore, after x-ray castration, despite the abundance of interstitial tissue, the uterus never enlarges. The most important fact is that the real growth and function of the uterus begin only at the time of puberty and are due to the growth and ripening of follicles with subsequent formation of corpora lutea. When this process ceases, the ovary shows a marked increase in connective tissue and atrophies. Likewise in the etiology of uterine hemorrhages the interstitial tissue plays no rôle. To be sure, there is a definite increase in interstitial cells in menorrhagia just as occurs before the menses, but there is a much greater development of interstitial tissue in pregnancy and also in radiated young amenorrhoic women.

If the interstitial cells were responsible for the sex impulse the latter would be most marked in children.

That the interstitial cells have some function no one will deny. The interstitial cells are at first only a depot for the nourishment of the growing follicles and corpora lutea. Later they are a storehouse through which and from which absorption takes place; but the source of all that makes a woman what she is, is the intact follicle apparatus.

J. P. GREENHILL.

Goto, N.: Experimental Investigations of the Internal Secretion of the Ovary by Means of Rat Parabiosis. Archiv für Gynäkologie, 1924, cxxiii, 387.

The author conducted a series of interesting experiments with white mice by performing celotomies and then uniting the animals in pairs, after the method of

Sauerbruch and of Heyde. Of the 268 pairs of mice thus united, 78 lived for more than one month, one pair living 28 months. The fact has been previously established that a definite body fluid exchange takes place wherever such a parabiosis is accurately carried out and the animals survive.

By uniting male and male, male and female, and female and female, and at the same time castrating one of the animals thus united either partially or completely, the author was able to produce, in the other member of the parabiosis, a compensatory hypertrophy of the ovary or testis, depending on the sex of the second animal. In the case of the ovary, this consisted in excessive follicle formation, hyperdevelopment of the corpora lutea, and excessive cyst formation. The majority of the follicles matured and degenerated without ever reaching the surface or rupturing. To the substance, producing this change, Goto gives the name "castrohormone." This substance also produces a hypertrophy and hypersecretion of the uterine mucosa.

These same changes in the ovary and uterus were produced by injecting the serum of castrated rats, male as well as female, into the circulation of normal female rats, thus proving the presence of a "castrohormone" in the circulation of castrated rats. "Castrohormone" is never found in the normal rats because such changes in ovaries and uterus could not be produced by injecting the serum of normal rats into the circulation of healthy female rats. RALPH A. REIS.

Wintz: Experimental Research on the Inner Secretions of the Corpus Luteum and Placenta. Deutsche medizinische Wochenschrift, 1924, l, 67.

These experiments were carried out to determine whether extracts made from corpus luteum and placenta had the same physiologic effect. Water solutions were carefully prepared. Both preparations proved chemically the same. The injection of either preparation into guinea pigs caused enlargement of the uterus and genitals and flowing. In the puerperium, the secretion of milk was increased.

Both preparations have no effect on the pregnant uterus.

In human beings the corpus luteum extract increased the coagulation time of the blood while the placenta extract decreased it. The former increased the viscosity of the blood, the latter decreased it. Both caused hyperemia of the genitals. The corpus luteum substance brought on menstruation in cases of amenorrhea. This result was never obtained with the placenta. Both together increased the effect in amenorrhea, apparently a reinforcement of the corpus luteum substance by the other. The placenta substance had a specific effect in causing enlargement of the breasts. In the climacteric, corpus luteum substance was beneficial, placenta being less reliable. Placenta substance was beneficial in dysmenorrhea.

Other experiments were done on man using lipoids obtained from the corpus luteum and placenta. Both lipoids had the same chemical qualities. The corpus luteum lipoid decreased bleeding where it was of a functional nature, as in the bleeding of puberty, not suddenly but gradually. In myoma bleeding, however, the flow was increased. The placenta lipoid decreased the bleeding more rapidly and in both types of bleeding. The corpus luteum lipoid had no effect on the viscosity of the blood while the other decreased it slightly.

Preparations which seem to be identical chemically differ in their physiologic properties. FRANK A. PEMBERTON.

Papanicolaou, George: A Specific Inhibitory Hormone of the Corpus Luteum. Journal of American Medical Association, 1926, lxxxvi, 1422.

The purified luteal extract was injected into guinea pigs who had previously been tested in regard to the regularity of their estrual cycle. Small quantities of from 1 to 2 c.c. cause a delay of the estrus (vaginal smear as biologic test). By giving weekly one injection, it is possible to suppress ovulation completely for a period of

from two to four months. Discontinuation of the injections was followed by ovulation after a few days. Similar extracts prepared from other parts of the ovary and from other organs all gave negative results. A larger dose of the extract causes a longer delay of ovulation. Inasmuch as the female sex hormone is also found in the corpus luteum it seems that both hormones are produced in the same organ. The proper luteal hormone and the female sex hormone act in an entirely different way and are, to a certain extent, antagonistic. The luteal hormone inhibits and delays ovulation, whereas the female sex hormone rather accelerates these processes. The luteal hormone does not cause hypertrophy in the genital tract of spayed females. Both hormones are active in pregnancy, one inhibits while the other stimulates, the two act simultaneously. Oral administration of extracts containing the luteal hormone yielded no results. GROVER LIESE.

Frank, Gustavson, Holloway, Hyndman, Krueger, and White: The Occurrence and Present Chemical Status of the Female Sex Hormone. Endocrinology, 1926, x, 260.

The writers claim positive proof of the existence of a hormone in the corpus luteum and their work indicates that this hormone is identical with the hormone found in follicles and placenta. Placentas were used as a base for the late investigations, which involved a chemical study of two problems: (1) Is the physiologic activity of crude extracts due to the specific substances alone, or can these responses be brought about by other substances? (2) What is the chemical nature of these specific substances?

The work showed negative results with numerous other substances and positive results only with the specific substance. The active principle withstood saponification with alkalies for a long period of time without loss of activity. Female sex hormone is the term given to the substance, the active principle of which is a thermostable lipoid of high molecular weight. It is elaborated by the gestational gland, taken up by the lymph and blood stream and selectively utilized only by Mueller's tract and the breasts. WILLIAM KERWIN.

Enfenger, H., and Bader, C. W.: Lipoid Content of the Ovary during Pregnancy and Atresia of the Corpus Luteum of Menstruation during Pregnancy. Archiv für Gynäkologie, 1925, cxxiv, 483.

The authors examined the lipoid content of thirty-four human ovaries removed from pregnant women and three removed during the early puerperium. The pregnancies ranged from four to forty weeks. Determinations were made by the dye method of Kawamura. They found a gradual decrease in the lipoid content of the ovaries as pregnancy progresses, at term only the slightest traces remain. The same holds true for the graafian follicle in pregnancy, only slight traces of lipoid being found. The majority of the lipoids are the esters of cholesterol and of cholesterol fatty acids. During the puerperium there is a rapid rise of lipoid content of the corpus luteum of pregnancy and of the follicles. Unruptured corpora lutea of earlier menstrual periods are regularly found in the ovaries of pregnant women until the middle and occasionally even until the end of pregnancy. It would seem, therefore, that the unruptured corpora lutea possess a more important function than has hitherto been ascribed to them. RALPH A. REIS.

Dignani, P. B., Onorato, F. P., and Piccardo, E. R.: Pathology of the Corpus Luteum. Revista Espanola de Obstetricia y Ginecologia, 1924, ix, 341.

The corpus luteum is an organ producing an internal secretion of the greatest importance to the female genital physiology. The interstitial gland of the ovary is of similar importance, as it is formed of the lutein cells of atretic follicles, and

therefore is closely allied to the corpus luteum. The corpus luteum controls ovulation and the relation between ovulation and menstruation; it controls the development of the fertilized ovum; it has a trophic action on the uterus; it controls the formation of the uterine decidua, and, in union with the fertilized ovum, brings about the formation of the placenta; in a later stage of development it inhibits ovulation; it influences mammary development and function. Finally, it is intimately associated with the rest of the endocrine system.

Menstruation is determined by internal secretion of ovary, especially that of corpus luteum and interstitial gland. Hyperfunction causes uterine hemorrhages, normal function gives rise to normal menstruation, and hypofunction to scanty flow or amenorrhea. The rôle of ovaries containing many atretic cysts in causing menorrhagias is therefore due to the overproduction of lutein cells and their secretions.

Hemorrhage from fibromyomata is probably not due to hyperfunction of the ovary alone, but results from a more complicated disturbance of endocrine balance. Hemorrhages of puberty are probably due to modifications of the corpus luteum.

Cysts of the corpus luteum are thought by some to be the cause of ectopic pregnancy by inhibiting the normal peristaltic action of the tubes. Cysts may rupture and cause intraperitoneal hemorrhage; sufficient cases have been reported to indicate that such rupture may occur without the presence of an ectopic pregnancy.

THOS. R. GOETHALS.

Pratt, J. P., and Allen, Edgar: Clinical Tests of the Ovarian Follicular Hormone. Journal of American Medical Association, 1926, lxxxvi, 1964.

Ovarian follicular hormone may be extracted from follicles, human corpus luteum or placenta. Its preparation has been described in previous papers of the writers. It has been sufficiently purified for injections into human beings without the slightest reaction. So far only the dosage of 1 c.c. fluid has been used. This dosage is rather small. There has been some difficulty to concentrate the hormone. The injection of this hormone into primates, monkeys and human beings from which the ovaries had been previously removed, produced growth of the uterus. The removal of ovarian follicular hormone by oophorectomy or the cessation of injections brought on menstruation in monkeys. Uterine growth and accompanying subjective symptoms similar to those experienced at time of menstruation have resulted from injections into patients whose ovaries had been removed previously. In cases of amenorrhea it has been impossible so far to restore the menstrual function.

GROVER LIESE.

Hancher and Rogers: The Diagnosis and Treatment of Hypoovarianism. Endocrinology, 1925, ix, 21.

Hancher and Rogers by oral administration and injections tested extracts from pig ovary to determine which gave the more uniform results. They concluded that a glycerin extract of the whole pig ovary was the most satisfactory. They found that after injecting a large amount of the extract intravenously in the dog, pituitrin appeared in the spinal fluid in fifteen or twenty mintues. When administered through a tube into the stomach of an anesthetized animal the pituitrin appeared more slowly but in large quantity. Follicular fluid, the corpus luteum, and the interstitial cells all give this reaction, but in extracts of the entire gland it seems most marked. They infer from this that ovarian feeding should stimulate the activity of the pituitary. In connection with this work one lobe of the thyroid was removed from a number of animals and five months later the other lobe removed when its iodine contents were found increased by 200 to 300 per cent. This would indicate a close relationship between the ovary and thyroid. By feeding a ten minim pill of the glycerin extract of the pig ovary three or four times daily to women

suffering from neuroses of the artificial or natural menopause very striking results were obtained, but in no case was the amenorrhea corrected. They conclude that a fresh glycerin extract of the entire fresh pig ovary is the best preparation for oral ovarian therapy. WM. KERWIN.

Pallen, Conde de S.: Some Menstrual Disturbances and Their Treatment with the Opposing Principles of Corpus Luteum. The Therapeutic Gazette, 1925, xlix, 407-410.

Agomensin, a lipamin, from the immature corpus luteum, has a stimulating effect on the uterus. Sistomensin, a luteo-lipoid from the full-blown corpus luteum, has an inhibiting action.

In nineteen cases, agomensin has given results in: Menopause, with relief of their symptoms (seventeen cases). Oligomenorrhea beneficially treated (one case). No benefit in amenorrhea (one case).

Sistomensin results are: Good as a hemostatic in uterine bleeding (three cases), but has no effect in dysmenorrhea (two cases). ADAIR AND HATHAWAY.

Vignes: The Ovarian and Uterine Cycle. Journal de Medicine de Paris, 1925, xliii, 895.

Vignes reviews the work which has been done on this subject both on women and on animals. He feels that altogether too much importance has been attached to the function of the corpus luteum, and that the true factor is the secretion of the ripening follicles, the corpus luteum merely carrying on their function temporarily after ovulation. The active element of the ovary should, therefore, be sought within the ovule. THEO. W. ADAMS.

Crainicianu, Al.: Experimental Researches upon the Relations Between the Internal Secretion of the Ovary and the Tonus of the Vegetative System. La Presse Médicale, 1925, No. 8, p. 117.

The relation existing between the vegetative system and the glands of internal secretion are not as yet thoroughly understood. It may be that they constitute one neuroglandular system, closely bound together, or, on the other hand, the two systems may be independent but interrelated, but the studies of Pachon seem to indicate that the latter theory is probably the more tenable.

The functions of these glands have been studied in the lower animals by means of observations made after extirpation of the various glands, but in the human subject healthy organs of this system are practically never removed, except in the field of gynecology. Normal ovaries are often removed along with the uterus when hysterectomy is performed, and the author decided to study the tonus of the vegetative system in young women thus castrated. He employed the Danielopolu and Carniol method: the pulse of the patient is taken while reclining: intravenous injections of atropine are given until the vagus is completely paralyzed, and the pulse is again counted. The latter figure is the sympathetic tonus, the difference between the two, the vagal tonus. The point of complete paralysis of the vagus is determined as follows: ordinarily, the pulse on changing from the prone to the standing position will increase in rapidity, and will drop back to the first figure on reclining again. If the patient is insufficiently atropinized, the pulse will drop *below* the first figure on reclining the second time, but if the vagus is paralyzed this abnormal slowing does not occur, as the pulse falls *to*, but not *below*, the figure first obtained. This method is much more reliable than the oculo-cardiac reflex.

In a series of cases thus studied, the author found a constant lowering of the tone in both systems. These observations lead to the conclusion that the internal

secretion of the ovary, acting in concert with those of the other glands of internal secretion, maintains the tone of the vegetative system. Similar researches, carried out on patients operated upon for various other complaints (without removal of the ovaries), gave only negative results. E. L. KING.

Sserdjukoff, M. G.: Endocrine Forms of Epilepsy. Archiv für Gynäkologie, 1925, cxxiv, 284.

The author describes a distinctive type of epilepsy which he feels is definitely due to disturbances of the endocrine glands, either singly or in groups. The etiology and pathogenicity of such an endocrine disturbance is found in connection with a certain specific constitutional status and with disturbances of the functions of the entire endocrine system, or at least in part. These groups which are most commonly affected include combinations of ovarian, thyroid, hypophyseal and uterine dysfunctions. The more severe types of such an endocrine epilepsy have a definite and rational surgical therapy as well as symptomatic or organotherapeutic forms of therapy. RALPH A. REIS.

Dietrich: A Forme Fruste of Dystrophia Adiposogenitalis and Its Experimental Basis. Zeitschrift für Geburtshülfe und Gynäkologie, 1924, lxxxvii, 146.

The author describes and illustrates with a number of cases a previously not differentiated endocrine disease syndrome which he designates as a forme fruste of dystrophia adiposogenitalis. He believes that this should be recognized as a separate entity on the basis of clinical findings, theoretical considerations, and the experimental proof of an hypophyseal disturbance in metabolism in the adrenalin blood-sugar curve. The disease occurs in small to medium-sized individuals who show a striking adiposity for their age. The history usually shows that the adiposity appeared in early youth and the fat deposits were localized to definite regions, hips, lower abdomen, nates, thighs, upper arms and breasts. Hands and feet, wrists and ankles are never affected. The menses usually appear late, there are periods of amenorrhea, often of years' duration and the bleeding is short, often lasting only for hours. Examination shows a more or less marked hypoplasia of external and internal genitalia. The labia majora and minora are poorly developed, the pubic hair scanty. The vagina is narrow, often short. The cervix is small, often conical. The uterus is usually well proportioned but small, often acutely anteflexed, in some cases it is of the infantile type, particularly when the disturbances date back to childhood. The ovaries are small and frequently cannot be palpated, partially on account of the thickness of the abdominal wall.

The author considers the etiology a primary hypophyseal hypofunction with secondary hypoplasia of the genital organs and characteristic fat deposits. These are determined not by the ovarian but by the hypophyseal hypofunction. Preparations of the anterior lobe of the hypophysis are indicated therapeutically but there is no satisfactory preparation on the market. The author has obtained the bests results with the pluriglandular preparations. Ovarian extracts are of no value whatsoever.
MARGARET SCHULZE.

Aschner, B.: The Influence of the Hypophysis on the Female Genital Organs. Medizinische Klinik, 1924, xx, 1681.

The hypophysis, like the pineal body, differs from the other glands of internal secretion because of its anatomic and apparently also functional connection with the brain. Contrary to the belief of Cushing and Biedl, extirpation of the anterior lobe of the hypophysis does not cause death. In dogs, complete removal of the anterior lobe or of the entire pituitary gland produces a cessation of growth and mental de

velopment with the persistence of juvenile fat distribution, milk teeth and especially a persistent infantilism of the genitalia. Conception was never observed in dogs from whom the hypophysis was removed. In six normal pregnant dogs the hypophysis was removed and these animals aborted within three days. Milk appeared in the breasts and involution was very slow. It is a question whether removal of the hypophysis alone or whether in addition the unavoidable stimulation of the midbrain produced the abortion. Nevertheless the author believes that the vagus and sympathetic tracts in the floor of the third ventricle can initiate uterine contractions. In adult animals removal of the pituitary gland produced no noteworthy changes in the genitalia.

Aschner maintains that in the majority of cases of prolonged and painful labor it is not the bony pelvis which is at fault but the soft parts. He believes therefore that the proper therapy for long and painful labor is stimulation of pains by means of quinine and pituitrin and also by manual dilatation of the external os of the cervix if the latter is effaced.

It appears that hypophyseal disorders occur much more commonly in women than in men and that women in general have a much more labile system of glands of internal secretion. In acromegaly, pregnancy does not appear to be disturbed but toxemia occurs more frequently. Just as acromegaly is chiefly a disease of the female, so does hypophyseal gigantism essentially affect the male. Gigantism in the female is associated with sterility, hence nothing is known about pregnancy in such women. Likewise nothing is known of pregnancy in individuals with dystrophia adiposa genitalis.

In recent years roentgen ray treatment of the hypophysis and the midbrain has been employed for hypophyseal disorders, also for hemorrhages from the genitalia and for symptoms of the menopause. Aschner however warns that such therapy is dangerous and should be used as a last resort only. J. P. GREENHILL.

Borchardt, L.: Thyreo-Sexual Insufficiency. Monatsschrift für Geburtshülfe und Gynäkologie, 1923, lxiv, 253.

The thyroid among all the glands of internal secretion is conspicuous because of its close relationship to the sex glands. With every physiologic change in the sex glands at the critical periods of life, changes are observed in the thyroid. At puberty the thyroid often enlarges, in some cases to form even a puberty struma. More rarely there occurs a puberty atrophy of the thyroid. Many women exhibit a premenstrual swelling of the thyroid, but most characteristic and most constant is the hyperplasia of the thyroid during pregnancy. After castration and at the beginning of the climacterium the thyroid often enlarges.

On the other hand, diminished function of the thyroid leads regularly to lack of development of the sex glands. In congenital and infantile myxedema as well as in endemic cretinism, there is absence of development of the gonads and of the secondary sex characters. Animal experiments show that thyroidectomy in young animals leads to hypoplasia of the sex glands and in adult animals to atrophy of the sex glands. These conditions can be remedied by thyroid therapy.

The simultaneous appearance of hypofunction of the thyroid and sex glands is called thyreo-sexual insufficiency. There are four distinct types, namely, puberty, puerperal, climacteric and the hypothyroid type.

The symptoms vary from the relatively infrequent myxedematous type to the very benign forms with mild symptoms, such as headache, obstipation, obesity, alopecia, skin eruptions, etc. It is not uncommon to find women who become obese and complain of oligo- or amenorrhea after their first labor. At the menopause we find symptoms of so-called benign hypothyroidism, such as headaches, neuralgia, alopecia, obstipation, rheumatism, obesity, arteriosclerosis, etc., all of which in many cases are curable by thyroid therapy.

Only in childhood does hypothyroidism inevitably lead to insufficiency of the sex glands. In adult life, however, we see cases of hypothyroidism without hypofunction of the gonads. The cases of pure hypothyroidism are less frequent than those of thyreo-sexual insufficiency. On the other hand, not all cases of hypogenitalism show signs of hypothyroidism but such occurrences are rare among women.

The course of thyreo-sexual insufficiency is usually benign. The mild cases are cured spontaneously, more outspoken cases require thyroid therapy.

J. P. GREENHILL.

Knaus, H. H.: The Action of Pituitary Extract Administered by the Alimentary Canal. The British Medical Journal, 1926, i, 234.

When pituitary extract is administered at any part of the alimentary canal, mouth, stomach, small intestine or rectum, pressor action is never observed. When pituitary extract is introduced into the stomach or small intestine it exerts no influence on the uterine muscle. When administered by the mouth, after a latent period of about eight minutes, it exerts a marked action on the uterus, increasing both the tone and automatic movements. The oxytoxic substance is therefore absorbed. The rectum also absorbs the oxytoxic substance though probably not so completely.

ADAIR AND PROSHIK.

Pighini, Giacomo: The Action of Thyroid Extract upon the Fetus and Pregnant Uterus. Policlinico (Sezione Medica), 1925, xxxii, 334.

Pighini studied the action of thyroid extract upon the sex glands and the products of conception, and showed that administration of the extract to a pregnant animal results in the death of the fetus and abortion. He used a solution containing one gram of the thyroid extract of the ox in 5 c.c. of physiologic saline solution. Subcutaneous injections in amounts varying from 2 to 4 c.c. are sufficient to produce in rabbits and dogs death of the fetus and abortion in practically every case. In dogs, injected with the extract during heat and becoming pregnant very shortly afterward, abortion occurred in 40 to 45 days. In rabbits the same treatment produced abortion in 25 to 25 days after fecundation.

Further investigations showed: In the adrenal gland these injections lead to a hyperproduction of adrenalin in the cortex but a hypoproduction in the medullary portion. In the cortex there is evident a scarcity of cholesterin and of phosphates. In the ovary is seen a great decrease in the cholesterin lipoids, a less rapid maturation of the germ cells and a degenerative involution of the germinative elements (linea ovuli). The cholesterin phosphates of the blood are augmented. Pighini believes that the variation in the secretion of adrenalin and the lipoid changes in the ovaries are responsible for the death of the fetus and abortion. J. M. PIERCE.

Fekete, A.: The Disturbances of Menstruation and the Influence of Organ Extracts upon Them. Monatsschrift für Geburtshülfe und Gynäkologie, 1923, lxiv, 267.

During the last decade it has been recognized that the ovaries give only the impulse which produces the menstrual changes in the uterine endometrium, while the bleeding itself as well as the clinical symptoms associated with the bleeding are independent of the ovaries and are due to constitutional, nervous and uterine factors. Schroeder's classification of uterine bleeding is as follows: (1) amenorrhea, the absence of menstruation in adult life; (2) oligomenorrhea, menstrual periods five or more weeks apart; (3) polymenorrhea, menstrual periods less than three weeks apart; (4) hypomenorrhea, scanty flow; (5) hypermenorrhea, profuse flow at the periods; (6) dysmenorrhea, pain or general discomfort at the periods; (7) metrorrhagia, bleeding at irregular intervals.

From experiments and clinical observations the author concludes that the disturbances in menstruation are not in every instance referable to the internal secretory disturbance of the ovaries. On the other hand, disturbances are frequently found in other organ systems, such as the nervous system and other glands of internal secretion, which while not directly in causal relationship with the disturbances of bleeding, are the stimulating factors. This is particularly true of the vasomotor system and explains the increased or diminished flow of blood as well as dysmenorrhea. Only where these factors do not appear to be active and where other signs (constitutional) speak for it, should we assume the ovaries are at fault. In such cases we find evidence of hypofunction of the ovaries as shown by a general infantile habitus, hypoplasia of the genitalia and only moderately developed secondary sex characters.

A large part of the menstrual disturbances are amenable to the injection of organ extracts. This is not to be attributed to a specific action but to a general action. Just as good results are obtained with injections of concentrated Ringer's solution.

J. P. GREENHILL.

Landecker, A.: The Significance of Combined Organotherapy and Ultraviolet Radiation for the Functional Disturbances of the Female Genitalia. Medizinische Klinik, 1925, xxi, 740.

The combined use of organotherapy and ultraviolet ray treatment has been found very useful in the treatment of genital hypoplasia and hypofunction both of the congenital and acquired types. This treatment consists in using ultraviolet rays through the vagina and the abdominal wall to produce crossfire radiation of the ovaries; and in addition, uterine, placental and hypophyseal (anterior lobe) preparations. This method is far safer and just as effective as x-ray therapy, of which the dosage cannot always be regulated. Animal and plant experiments have proved the value of ultraviolet rays for the maintenance, rejuvenation and growth of organic life.

J. P. GREENHILL.

Allen, Edgar, and Ellis, M. M.: The Effect of Ultraviolet Rays on the Hormones of the Ovarian Follicle and Placenta. Journal of the American Medical Association, 1925, lxxxv, 94.

The experiments show that exposure to the ultraviolet rays destroys both the ovarian and the placental hormone and further, that the action is on the hormones rather than on the oil used as a solvent. Most probably this destruction is caused by oxidative changes, as it is well known that ultraviolet rays promote oxidation of some substances.

GROVER LIESE.

Küstner, H.: The Internal Secretory Changes After Extirpation of the Uterus, Operative Castration, Roentgen Ray Castration, and the Normal Climacterium. Monatsschrift für Geburtshülfe und Gynäkologie, 1925, lxx, 284.

The author found that x-ray and operative castration always produced severe symptoms, such as heat sensations, chills, palpitation of the heart and headache, whereas women in whom hysterectomy had been performed felt well after operation. The subjective castration symptoms disappeared after one or one and one-half years in most patients. If symptoms appear after hysterectomy they are usually due to changes in the circulation.

The Lüttge-Mertz reaction enables us to test the function of every gland of internal secretion. A positive reaction indicates a pathologic condition. Küstner studied the serum of women who were having a normal climacterium, patients who had their uterus removed, patients who had both uterus and ovaries extirpated, and patients who were castrated by means of the x-ray. The serum of patients who were having a normal climacterium and the patients in whom the uterus or the uterus and ovaries

were removed gave no reaction with ovarian substance. However, serum of patients who had been subjected to the roentgen ray gave a positive reaction. His explanation is as follows: When the ovaries cease to function normally, no change is found in the serum. If the uterus alone is removed the ovaries function normally. When both ovaries are removed, no reaction is obtained because there is no internal secretion of the ovaries. However, when a patient is treated with x-ray a definite change takes place. The follicle apparatus is destroyed completely but a change in the internal secretion of the ovaries is produced. This change has not been detected histologically up to the present time. There may be a connection between x-ray treatment and subsequent formation of carcinoma of the ovary. The author concludes that the use of x-ray to produce castration causes not only a cessation of the normal function but it also substitutes a diseased function. For this reason hyterectomy is preferable to the x-ray where operation is not contraindicated.

J. P. GREENHILL.

Tuffier, Th., and Bour, D.: Ovarian Grafts. Experimental and Clinical Results Concerning Menstruation, Fecundation and Pregnancy. Presse Médicale, 1925, xxxiii, 1073.

This article constitutes an excellent review of the subject of ovarian grafting. Particular attention is given to the operation of grafting the ovary into the cavity of the uterus, with its pedicle preserved intact.

From a study of the literature, as well as from their own rich experience, the authors draw the following conclusions:

(1) Free grafts, grafts of ovarian tissue without preservation of the blood and nerve supply, especially if autografts, are usually followed in from three to five months by the reestablishment of menstruation, which generally persists for from five to ten years. If the graft is in the uterus, pregnancy may supervene, as has been proved by animal experimentation as well as by clinical experience in the human. Twenty-four such operations in women have been reported, with six known uterine pregnancies and one probable ectopic pregnancy. Free homeografts (ovarian tissue from another woman), while generally of no avail, have been followed by pregnancy twice (cases of R. T. Morris).

(2) The transplantation of the ovary with intact vascular and nervous pedicle into the uterus is a logical and useful operation in properly selected cases. The nutrition of the ovary is provided for, ovulation occurs, and the ovule is discharged into the uterus, hence fecundation and nidation are possible. Menstruation is not as a rule disturbed either in its rhythm or duration, and the discomforts of the surgical menopause are avoided. The only disadvantage is that 50 per cent of the patients complain of slight premenstrual pain. Of the forty-nine operations of this type reported, forty-one were followed up. Eighteen menstruated within one month after operation, nine within two months, five within three months, two did not menstruate at all, and the others began to menstruate at intervals varying from three months to one year after operation. Three patients were subjected to hysterectomy subsequently, two for constant pain, one for intestinal obstruction from adhesions (but not to the site of the incision made when the ovary was transplanted). No pregnancies have resulted in these forty-one patients, but many of the women were of the type who are not desirous of pregnancy.

E. L. KING.

Bell, W. Blair: Ovarian Grafting. Surgery, Gynecology and Obstetrics, 1925, xli, 706.

The question of the employment of ovarian grafting in preference to the so-called "clean sweep" is no longer open to discussion. Ovarian transplantation is a procedure no scientific gynecologic surgeon can afford to neglect.

When the surgeon has decided that it is impossible safely to conserve any ovarian tissue in the normal position, the next consideration arises in regard to the best method of transplantation. It is generally conceded that to secure a functional result the procedure should always be autoplastic. Homeoplastic grafting with ovarian tissue from another woman is very rarely effectual; and heteroplastic ovarian implantation with tissue from another animal is useless.

The ovarian tissue removed, is separated from other structures, such as the tube, and a long silk thread on a sharp needle is passed through it. The two ends of the thread are knotted together, and the ovary so tethered is placed in the pouch of Douglas, or elsewhere in the peritoneal cavity, the ends of the thread being brought through the laparotomy opening and held in a pair of forceps. In this way the ovarian tissue is kept moist and warm in natural surroundings until required for grafting. When the operation for the primary lesion has been completed, but before the laparotomy wound is closed, the ovary is recovered by withdrawing the thread attached to it and is placed on a sterilized square of rubber, six inches in diameter. A very sharp grafting knife is taken, and the hard cortex is shaved off the ovary or pieces of ovary as the case may be. Then by a series of crisscross incisions the whole piece of ovary is divided into small parts which are still held together by the underlying layer of tissue. The exposure of such a large area of surface and the limited size of the fragments tend to insure rapid vascularization of the implanted tissue. There is also less chance of follicular cyst formation.

An opening is made into the sheath of the rectus muscle and closed blunt pointed forceps are pressed into the body of the rectus muscle. The blades are then slowly opened parallel to the surface. It is most important that there be no bleeding for although grafts must be implanted in vascular areas, if the grafted tissue is bathed in blood it cannot become attached to the surrounding structures from which nutrient is to be drawn. The ovarian graft is now passed into the middle of the muscle and laid flat among the fibers. The edges of the rectus sheath are brought together with a couple of sutures and the laparotomy wound is closed.

After histories on only 70 per cent of cases subjected to ovarian grafting were obtained, the total number of cases recorded were 187.

After the ovaries have been completely removed from the normal position, and even though ovarian tissue has been transplanted there is a period between the operation and the time when the graft has become completely vascularized and is supplying internal secretion to the host during which the patient may suffer with all the physical and psychic disturbances of the menopause. The duration varies from one to eight months after operation, and as soon as the transplanted tissue becomes fully functional these disturbing symptoms disappear, often coincidentally with the reappearance of menstruation, if that is possible.

Menstruation when it appears may be quite regular for many years. A number of the patients are still menstruating normally and regularly seven years after operation.

WM. C. HENSKE.

Rouffart-Thiriar: Transplantation of the Ovaries into the Uterus. Bruxelles-Medical, 1926, x, 316.

Of late there has been a tendency toward less radical treatment than complete castration in bilateral adnexal inflammation. Along this line the author discusses the procedures of Estes and Tuffier. Both of these workers transplanted one ovary into the uterus, the operative technic varying slightly.

Estes who did the operation one hundred times has followed up the results in twenty-seven cases. In four the menstrual periods were slightly accentuated, while in one case they continued normally. Three cases had to be reoperated because of pain due to cystic degeneration of the ovary. Seven cases complained of slight pain

in the side. Ten were somewhat "nervous" and presented symptoms of hyperthyroidism. Four cases subsequently became pregnant, two aborting, while in the other two instances the children were carried to term.

Tuffier's results were equally as satisfactory.

One case operated on by Tuffier's technic died nine months later following an operation for acute intestinal obstruction. The pelvic organs were then obtained for careful study. Microscopic examination showed that recent ovulation had occurred in the transplanted ovary, the ova having been discharged into the uterine cavity. Aside from slight fibroid atrophy the ovary was perfectly adapted to its new environment.

THEODORE W. ADAMS.

Sserdukoff, M. G.: Intra-Uterine Transplantation of the Ovaries. Gynécologie et Obstétrique, 1926, xiii, 164.

This procedure was first carried out by Palmer-Dudley in 1899. He operated on nine women and established the principle of preserving the entire ovarian circulation. To this end he found transplantation in the tubal cornua more satisfactory than in the posterior wall. In 1907, Lissianski, operating on dogs, obtained histologic confirmation of the normal growth of ovarian tissue in the wall of the uterus (follicles, corpus luteum, etc.). Storer, in 1915, first obtained a pregnancy by this operation. The large volume of work done since this time has been reviewed by Hartmann who states that this procedure creates conditions favoring gestation, which may be expected to persist. He places the incidence of an early pregnancy following this operation at 10 per cent.

The chief value of the operation is in the cure of sterility due to occlusion of the tubes. The chance of a pregnancy is increased not alone by the probability of the delivery of ova into the uterine cavity, but also by the improved hormone balance due to the freeing of the ovary which is generally involved by the process causing the occlusion. One of the author's cases had an absolute, and the other a relative occlusion of the tubes, as determined by insufflation. In these cases an ovary was freed, and transplanted in the region of the excised isthmic portion of the tube. The author points out that it is important to conserve at least one of the vascular pedicles of the ovary. It is not necessary, as formerly believed, to cover the abdominal end of the transplanted ovary with peritoneum. Trauma, (the use of too many sutures, etc.) is to be avoided. It is too early to report results in these cases.

GOODRICH C. SCHAUFFLER.

Sippel, Paul: The Homeoplastic Transplantation of Ovaries in Schizophrenia. Klinische Wochenschrift, 1925, iv, 401.

After the satisfactory results obtained by homeoplastic transplantation of ovaries in primary and secondary hypogenitalism, the author has enlarged the field of transplantation to schizophrenia, and possibly to climacteric psychoses.

In schizophrenia (dementia precox) he found a considerable percentage of patients to have a more or less pronounced hypoplasia and underfunction of the genital system. In a series of 176 cases of dementia precox, Fraenkel had ascertained 72 per cent of marked infantile changes in the genitals. Geller agreed with Mott, Fraenkel, Hauck, and Koehler, that there is a close relationship between subnormal genital function and dementia precox.

On the basis of these findings he has to date transplanted ovaries to 6 young women with dementia precox. A close control of their psychiatric condition was possible as these cases were kept in the Hospital for Mental Diseases at Dalldorf.

The operated cases were schizophrenics of ages between eighteen and twenty-four. The status of their genital systems was definitely ascertained by means of diagnostic curettage and laparotomy, and showed mild, medium, and severe grades of hypo-

plasia. In five cases the uterine mucous membrane was entirely functionless. In three cases there was a mature ovum in the ovary and no corpus luteum formation. In two cases an old corpus luteum in advanced retrogression was found, which did not fit in with the stated menstrual period. In practically all cases there was pronounced disturbance of maturation of the ovum associated with a functional disturbance of the uterine mucous membrane due to hypoplasia of that organ.

Two girls, showing schizophrenia with a slight grade of hypogenitalism, showed progressive improvement two to four weeks after transplantation. Their hallucinations, negativism and depressive symptoms disappeared almost entirely, their periods were more normal, the patients took on a healthy appearance and were discharged, as improved, two months after transplantation.

In one case, age nineteen, schizophrenia of two years duration and marked underdevelopment of the genital system, the psychiatric condition was unchanged after operation.

The author concludes, that by means of homeoplastic transplantation of ovaries, good results were obtained in three early cases of schizophrenia, which showed a light grade of hypogenitalism. ADAIR AND SAFFERT.

Sippel, P.: Treatment of Profuse Hemorrhage by the Transplantation of Ovarian Tissue. Zentralblatt für Gynäkologie, 1926, l, 99.

Profuse genital hemorrhage in puberty and later in life is frequently due to a hypofunction of the ovaries. Persistence and cystic degeneration of the follicle, as well as a complete lack of a corpus luteum, are the most common pathologic findings in such cases. Twenty cases of this type, which had all been treated unsuccessfully by other methods, were subjected to curettage and laparotomy for the correction of malpositions and removal of gross pathologic changes. Several pieces of normal ovarian tissue were finally transplanted into the muscles of the abdominal wall. The results of the procedure were most satisfactory. These patients menstruated regularly and the flow was of normal duration. During one of the next regular menstruations all patients were curetted once more, in order to compare the microscopic picture of the endometrium with the one seen at the time of the profuse bleeding. Most cases at second curettage showed an endometrium of good functional activity containing an abundance of glycogen. GROVER LIESE.

Mansfield: Replacing and Regulating Ovarian Function. Zentralblatt für Gynäkologie, 1925, xlix, 537.

Starting from the assumption that in the absence of the uterus the ovarian function fails very rapidly he undertook autoplastic transplantation of the ovary in fifty cases and concludes that this procedure gave good results without exception in all cases of the removal of the appendages where the uterus was conserved. When the uterus was removed (radical operation), only one-half the cases were benefited by the transplant.

Better results were obtained where it was possible to conserve one ovary, as the transplantation seemed to delay the ordinary effect of the removal of the uterus on the remaining ovary. Sexual excitability was increased more often and more markedly when the uterus was removed than when it was allowed to remain. The autotransplantation introduced the same conditions regarding ovulation of the remaining ovary as after a homeoplastic, and may be considered a substitute for this procedure.

Unilateral radiation is a satisfactory remedy for excessive menstruation due to hyperfunction of the ovaries. Dysmenorrhea too is favorably influenced where hyperfunction leads to sexual aberration. Operative reduction of the ovary gives satisfactory results. LITTLE.